



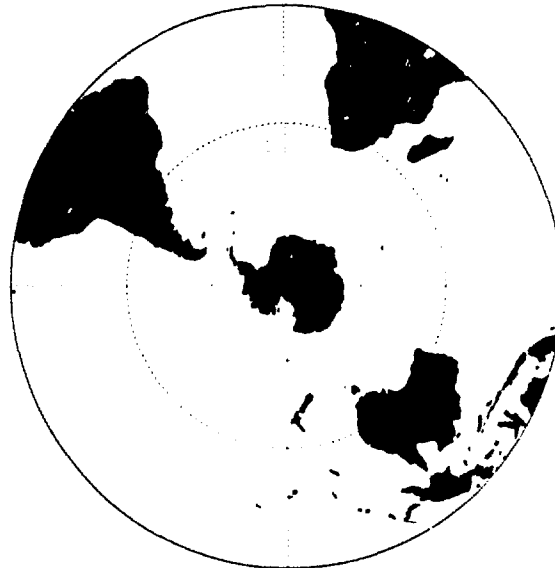
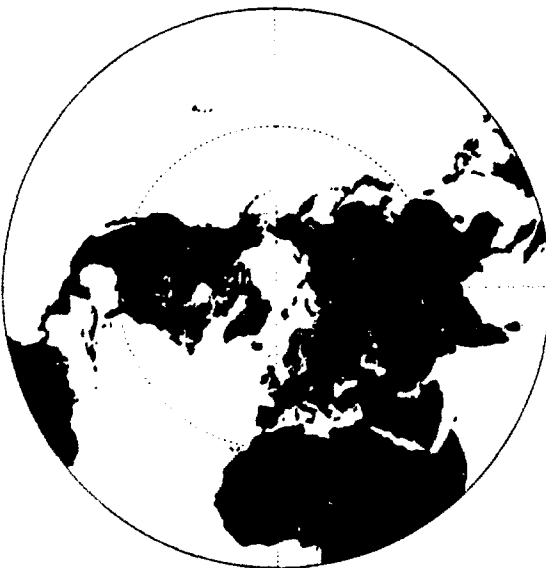
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AWS/TR-89/010

JOINT U.S. NAVY/U.S. AIR FORCE CLIMATIC STUDY OF THE UPPER ATMOSPHERE

VOLUME 10 - OCTOBER

JULY, 1989

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PREPARED BY
NAVAL OCEANOGRAPHY COMMAND DETACHMENT
ASHEVILLE, N.C.

PREPARED UNDER THE AUTHORITY OF
COMMANDER, NAVAL OCEANOGRAPHY COMMAND
STENNIS SPACE CENTER, MS 39529-5000

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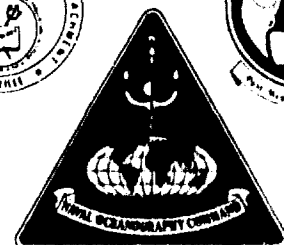
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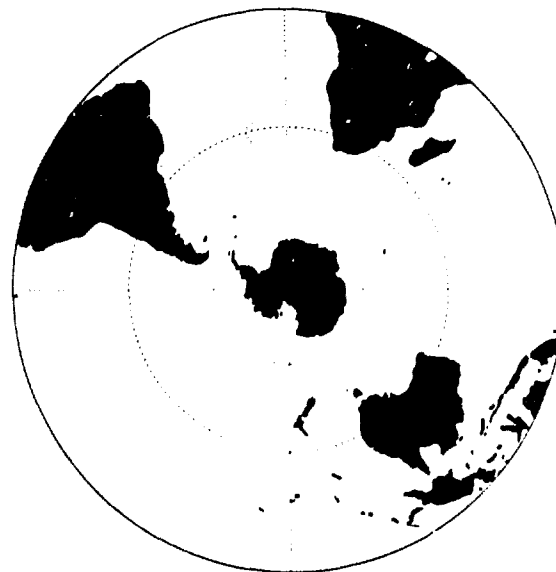
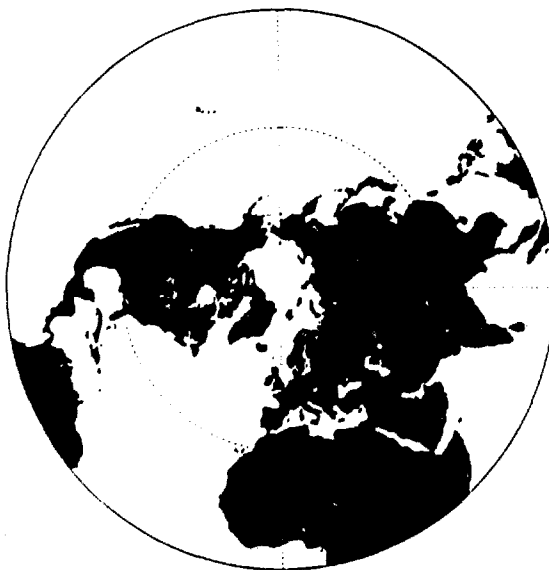


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19 ABSTRACT (Continue on reverse if necessary and identify by block number) This study of the upper atmosphere is based on 1980-85 twice daily gridded analysis produced by the European Centre for Medium Range Weather Forecasts. Included are global analyses of (1) Mean Temperature/Standard Deviation, (2) Mean Geopotential Height/Standard Deviation, (3) Mean Density/Standard Deviation, (4) Height and Vector Standard Deviation. All for 13 pressure levels - 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, 30 mb. In addition, analyses of (5) Mean Dew Point/Standard Deviation - levels 1000 through 300 mb, (6) jet stream (mean scalar speed) - levels 500 through 30 mb. Also included are global 5 degree grid point wind roses for the 13 pressure levels.				
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All other editions are obsolete.

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INTRODUCTION

During the past decade, improvements in the collection and assimilation of data required for more accurate representations of the atmosphere have resulted in data sets useful for developing a more definitive climatology of the global atmosphere. Such a climatology has uses in aircraft operations and planning, indirect assessments of atmospheric transport as well as a standard state from which atmospheric anomalies can be analyzed.

Prior climatologies, U.S. Navy (1959), U.S. Navy (1966), Naval Weather Service Command (1969), and Naval Weather Service Command (1970), were produced from individual station data with varying periods of record, and the resulting summarized data were analyzed. A serious deficiency was the lack of reporting locations in the major ocean basins. Analyses over the oceans were derived by extrapolating from known analyses over coastal regions as well as the few island or ocean vessels available. An additional complication was the manually intensive effort required to ensure horizontal and vertical consistency of the data.

With the advent, in the 1970s, of more powerful computers and data collection and assimilation systems, the initial analyses used for input into forecast models had a three-fold advantage over the station analyses utilized in the prior climatologies. First, the data assimilation system utilized a greater variety of information for production of an analysis. The normal array of land-based upper air reporting stations was supplemented by ship-based reporting stations, cloud reports, pilot reports and, most importantly, satellite-derived temperature, moisture and wind data. Consequent analyses more accurately represented the state of the atmosphere at a given observation time. Second, the assimilation system quality-controlled all incoming data and ensured the horizontal and vertical consistency of the resulting analyses. Finally, through the computer-based system, global data were available and archived in grid-point form.

A number of analysis sets produced by various national and international meteorological services were investigated. It is recognized that improvements to the data assimilation and analysis systems occurred within any analysis set produced, and that current analyses more accurately reflect the atmosphere's state than do the earlier analyses. It is also recognized that specific parameter or geographic-based deficiencies exist in all analysis sets. However, the intent of this upper-air climatology effort is the production of analyses to serve the needs of the operational meteorologist. A climatology derived from global analyses achieves this goal. Based on known capabilities and technical reviews of the various systems, as well as recommendations from the professional numerical modeling community, the analyses produced by the European Centre for Medium-range Forecasts were selected for processing.

ECMWF DATA

The European Centre for Medium-range Weather Forecasts (ECMWF) is an international organization established in 1973 and supported by 17 member states. It is responsible for providing global forecasts to the European community. Their data assimilation system consists of multivariate optimal interpolation analysis allowing the incorporation of a variety of observations with differing error characteristics and spatial distributions. A relatively comprehensive coverage of global data is ensured through the data collection schedule. A unique feature of the ECMWF system is the method of grid point analysis. Rather than analyzing individual grid points, varying sized boxes (depending on data density) are created containing groups of grid points. Grid point analysis uses data from within the box as well as adjacent boxes, thereby assuring a consistent analysis between all the grid points.

The system also includes internal quality control which examines the climatological reasonability of incoming data as well as the internal consistency of the data.

In addition, the system utilizes a model initialization process which ensures that harmful gravity waves, caused by imbalances in the analysis, with the potential to create problems in subsequent forecast fields, are suppressed. Through the initialization process, the atmosphere's mass and wind fields are adjusted so that only a portion of the gravity wave balanced by dynamic and physical processes is retained. Further information on the ECMWF system is available in Lorenc (1981), Shaw, et al. (1984), Lonnberg, et al. (1986), and ECMWF (1988).

The resulting initialized analyses are vertically interpolated to these 13 standard pressure levels: 1000, 850, 700, 500, 400, 300, 250, 200, 150, 100, 70, 50, and 30 mb, and include the geopotential height, temperature, and wind for all levels with moisture included for the 1000 through 300 mb levels.

Six years (1980-1985) of individual analysis were obtained from ECMWF on a 2.5° global grid. Although the analyses were permanently archived as spherical harmonic coefficients, ECMWF reconstituted the analyses for use in the data processing. Synoptic analyses at six-hour intervals were received for the six-year period, but only the 00 and 12Z analyses were re-sorted into a grid point sort. Given the quality control performed by ECMWF on collected data and the requirements for horizontal and vertical data consistency imposed by the assimilation system, minimal quality control was performed prior to summarization. Primary quality control was limited to comparison of level data against known/estimated climatological extremes.

The summarized grid point data were objectively analyzed, machine-contoured by parameter and level on polar stereographic (0°-90°N and S) and cylindrical equidistant (0°-60°N and S) projections with resulting contours machine-labeled. In addition, individual wind observations were consolidated into eight 45° segments centered on directions north, northeast, through northwest for display as wind roses on a series of cylindrical equidistant projections.

Since the ECMWF analyses were archived as spectral harmonic coefficients, the grid point reconstitution process provides data for all global 2.5° grid points. This naturally includes (for the 1000 through 700 mb levels) selected grid points at which the land elevations exceed the height of the pressure surface. For these grid points, a blanking program was used to eliminate both contours and grid point wind roses.

ANALYSES

1. Pressure-Height

Grid point geopotential height values (in dekameters) are summarized by month for 13 levels from 1000 mb to 30 mb with solid and dashed contours of mean values presented on pressure height charts. Standard deviation of height is calculated from the individual daily values with contours presented on a separate chart series including the standard deviation of vector mean wind. Local points of highest and lowest pressure are designated with H's and L's on the analyzed charts. Not all pressure centers are enclosed by closed contours. Vector mean wind in 5-knot increments are calculated for selected grid points considered adequate to depict flow for the hemisphere with wind shaft orientation related to specific latitude/longitude lines. Vector mean winds less than 2.5 knots are depicted as a shaft with no barbs. Contours of mean geopotential height and vector mean wind barbs are presented for the northern/southern hemispheres on polar stereographic projection and for 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

2. Wind Roses

Wind roses for 10° grid points from 5° to 85° north and south are presented by month for all levels from 1000 mb to 30 mb. Each hemisphere is divided into three longitudinal zones: 60°W to 60°E, 60°E to 180°E, and 180°W to 60°W. Each rose presents:

- a) Scalar mean speed
- b) Percent frequency of occurrence from each of 8 cardinal point wind directions proportional to shaft length with dots on the shafts representing 5 percentile intervals.
- c) Mean speed for each of the 8 cardinal wind directions rounded to the nearest 5 knots.

Roses for grid points on the 1000 mb through 700 mb level charts are blanked whenever the land elevation exceeds the mean geopotential height of the specified level.

3. Temperature

Grid point temperature data (in °C) are summarized by month for 13 levels from 1000 mb to 30 mb with solid and dashed contours of mean values presented on pressure height charts. Temperature standard deviation derived from the individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

4. Dew Point

Grid point moisture data were received as mixing ratios for the period through April 19, 1982 and as relative humidity thereafter for the 1000 through 300 mb levels. All moisture data were converted to dew point values. These are summarized by month with solid and dashed contours of mean values presented on pressure height charts. Dew point standard deviation derived from the individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

5. Density

Grid point density data were computed from the daily values of temperature and pressure from the equation of state in the form

$$\rho = \frac{P}{RT}$$

where ρ is the density, P is the pressure, T is the temperature, and R is the gas constant. Density was computed for moist air through 300 mb and for dry air from 250 mb to 30 mb. Density data (in Kg/m³) are summarized by month for all 13 levels with solid and dashed contours of mean values presented on pressure height charts. Density standard deviation derived from individual observations are shown on the same charts with dotted contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

6. Standard Deviation of Height and Vector Mean Wind

Standard deviation of the height and vector mean wind data presented on the pressure height charts are presented on monthly charts for the 1000 through 30 mb levels. Height standard deviations (in dekameters) are presented as solid contours and vector wind standard deviations (in knots) as dashed contours. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections with blanking for appropriate high elevation land areas on the 1000 through 700 mb charts.

7. Jet Stream

Grid point scalar mean wind speed (in knots), as presented by the value in the center of the wind rose octagons, are summarized by month and analyzed for 500 through 30 mb. All speeds exceeding 50 knots are shaded with shading intensity increasing by 25-knot increments. Contours are presented for both the northern and southern hemispheres on a polar stereographic projection and for the zone from 0° to 60° north and south on cylindrical equidistant projections.

DATA AVAILABILITY

Monthly summarized grid point data for the period of record for all levels from 1000 through 30 mb have been retained on magnetic tape. Data available, per level, include:

- Number of observations
- Mean zonal wind component and standard deviation
- Mean meridional wind component and standard deviation
- Vector mean wind and standard deviation
- Mean temperature and standard deviation
- Mean dew point (through 300 mb) and standard deviation
- Mean geopotential height and standard deviation
- Mean density and standard deviation
- Mean scalar wind speed and percentage of observations for each designated direction

Similarly summarized data for each half-month of the 1980-85 period are also available on magnetic tape. Summaries can be provided on magnetic media or in listing form by the National Climatic Data Center.

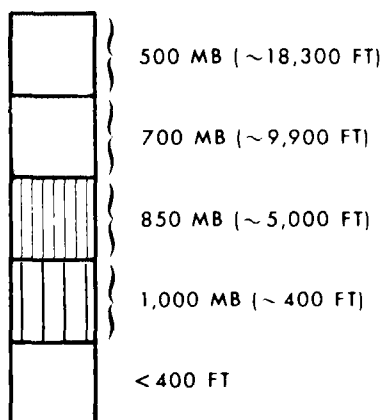
REFERENCES

- ECMWF, 1988: User guide to ECMWF products.
- Lorenc, A.C., 1981: A global three-dimensional multivariate statistical interpretation scheme. Monthly Weather Review, **109**, 701-721.
- Lonnberg, P., J. Pailleux, and A. Hollingsworth, 1986: The new analyses system. ECMWF Technical Memorandum No. 125.
- Naval Weather Service Command, 1969: Climate of the Upper Air - Southern Hemisphere, VOL I, Temperature, Dewpoint and Heights at Selected Pressure Levels, NAVAIR 50-1C-55.
- Naval Weather Service Command, 1970: Selected Level Heights, Temperatures and Dewpoints for the Northern Hemisphere, NAVAIR 50-1C-52.
- Shaw, D.B., P. Lonnberg, and A. Hollingsworth, 1984: The 1984 revision of the ECMWF Analysis System. ECMWF Technical Memorandum, No. 92.
- U.S. Navy, 1959: Upper Wind Statistics Charts of the Northern Hemisphere, VOL I-III, NAVAIR 50-1C-535.
- U.S. Navy, 1966: Components of the 1000 mb Winds of the Northern Hemisphere, NAVAIR 50-1C-51.

PRESSURE - HEIGHT
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean height (solid and dashed lines) in geopotential dekameters;
example: 580 is 5800 geopotential meters; solids labeled, dashed intermediates unlabeled
- Height labeled interval:
 - 6 dekameters (60 meters) - 1000 MB to 400 MB
 - 12 dekameters (120 meters) - 300 MB to 200 MB
 - 8 dekameters (80 meters) - 150 MB to 30 MB
- Vector mean wind in knots
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



Mean Geopotential Height (dkm)

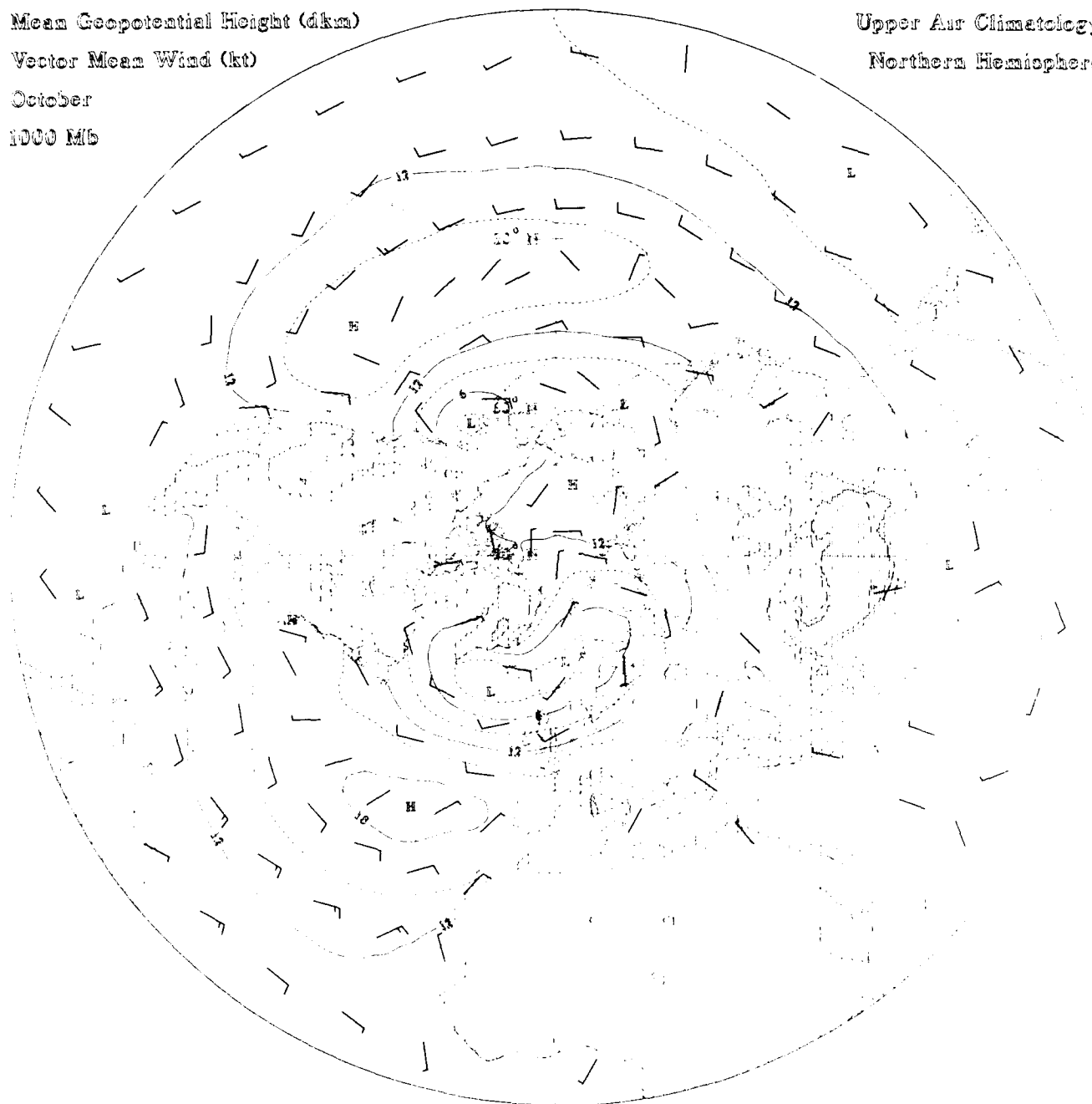
Vector Mean Wind (kt)

October

1000 Mb

Upper Air Climatology

Northern Hemisphere



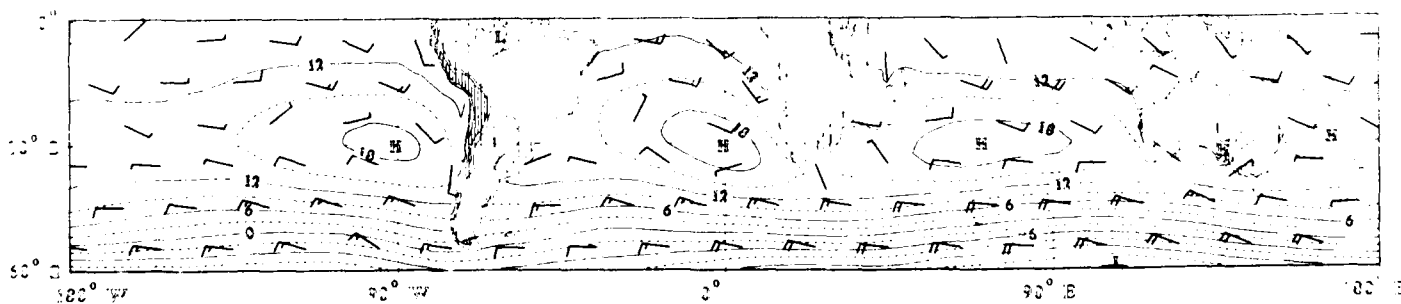
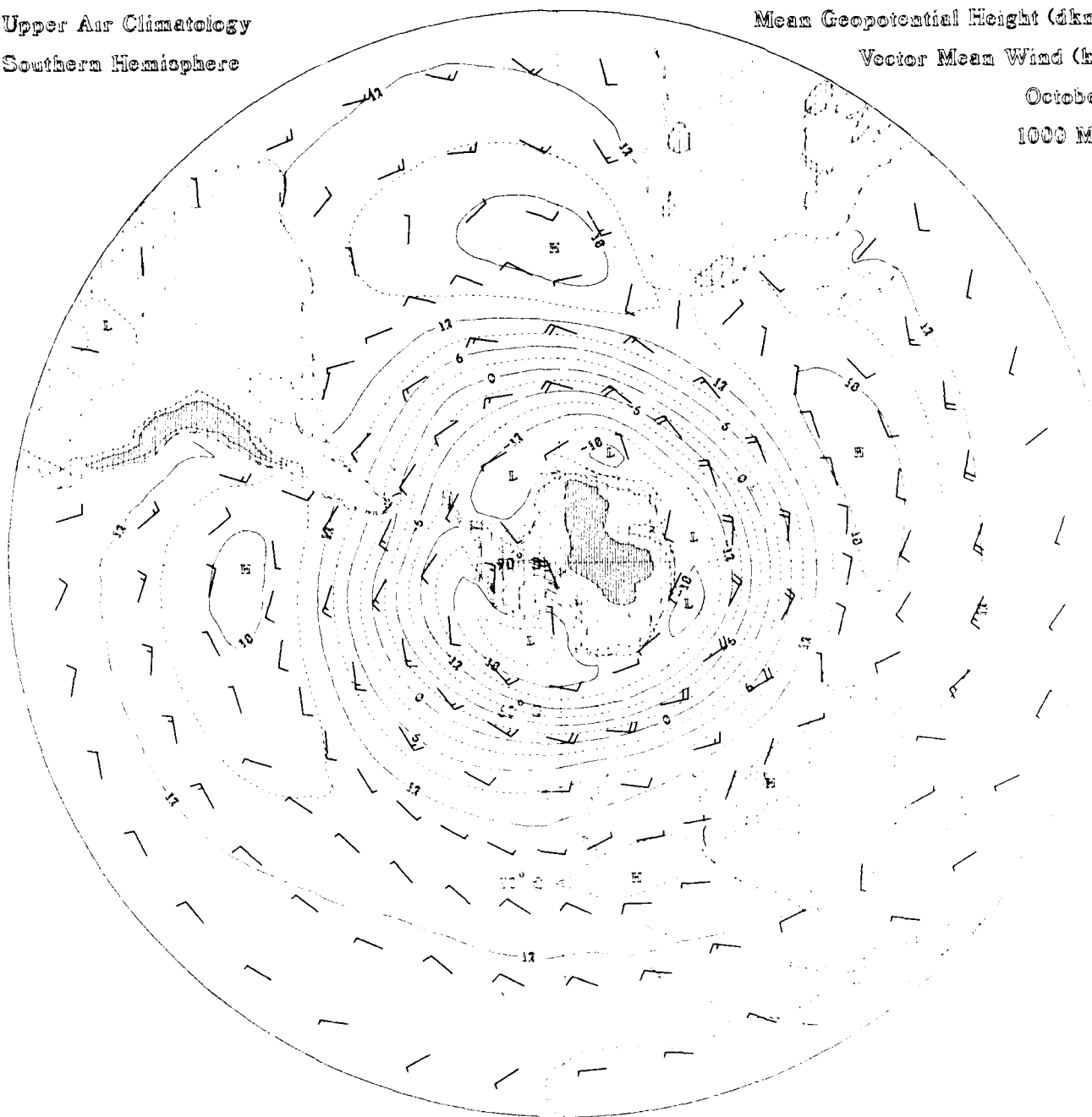
Upper Air Climatology
Southern Hemisphere

Mean Geopotential Height (dkm)

Vector Mean Wind (kt)

October

1000 MB



Mean Sea Level Height (mms)

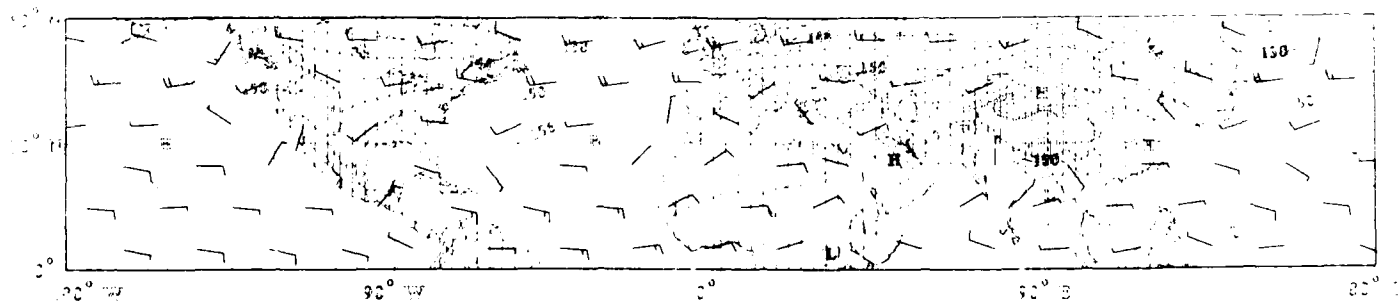
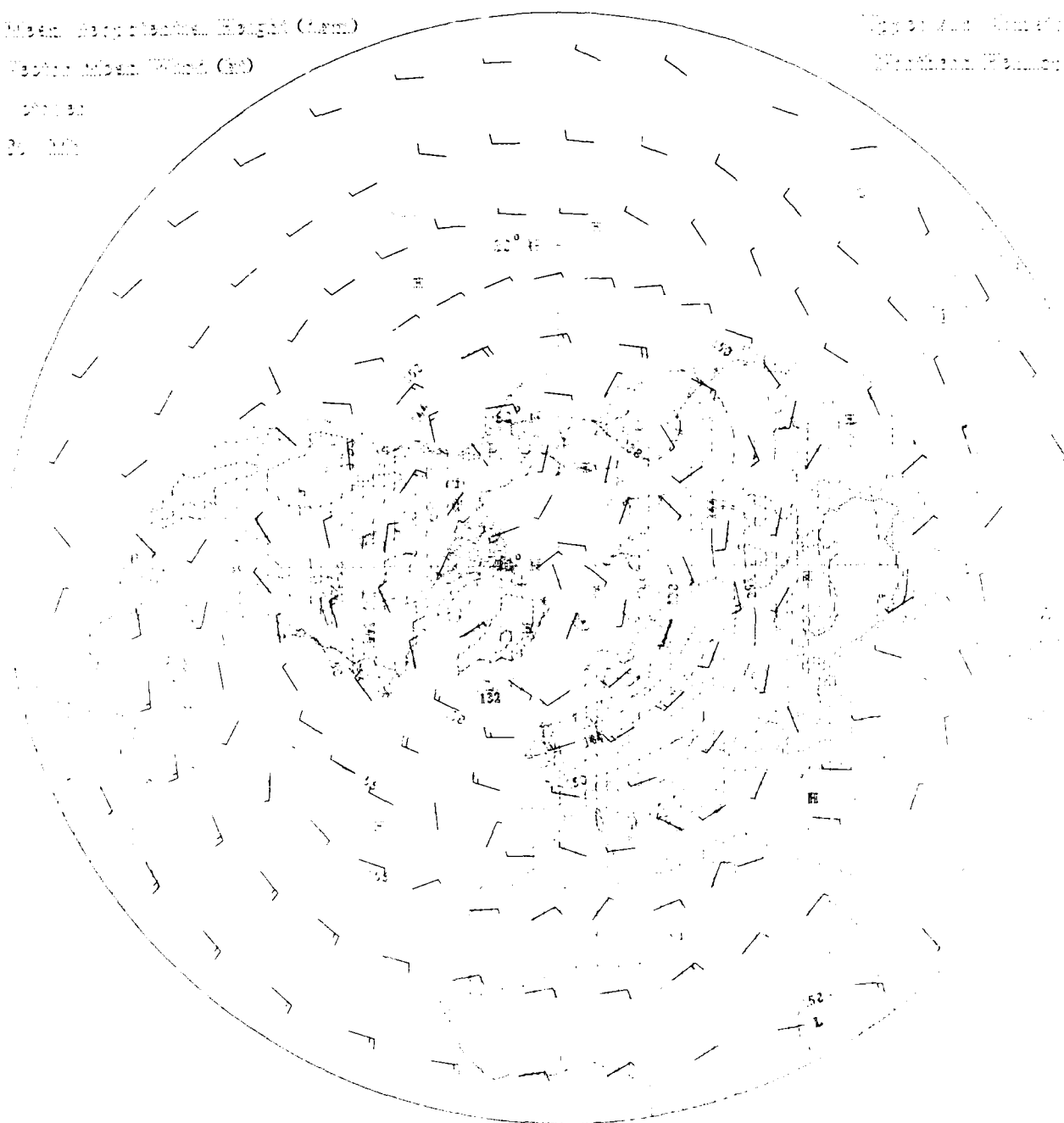
Mean Sea Wind (m/s)

000000

20 100

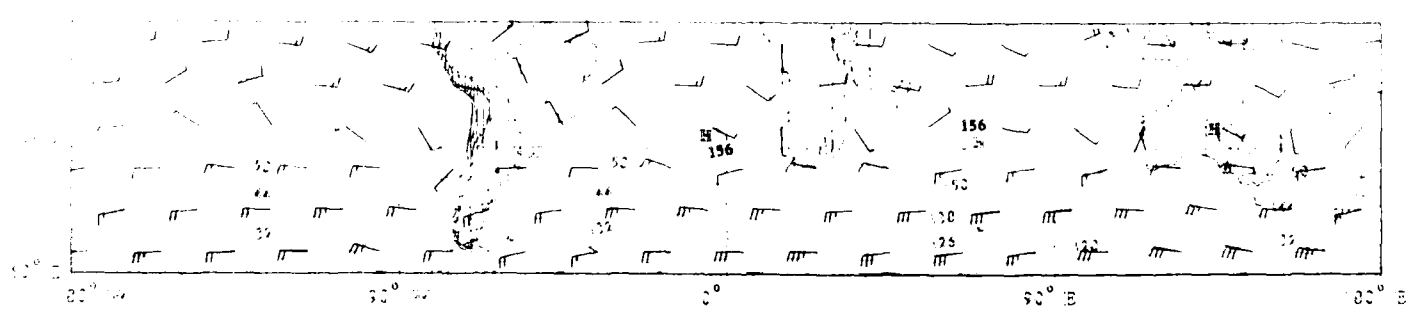
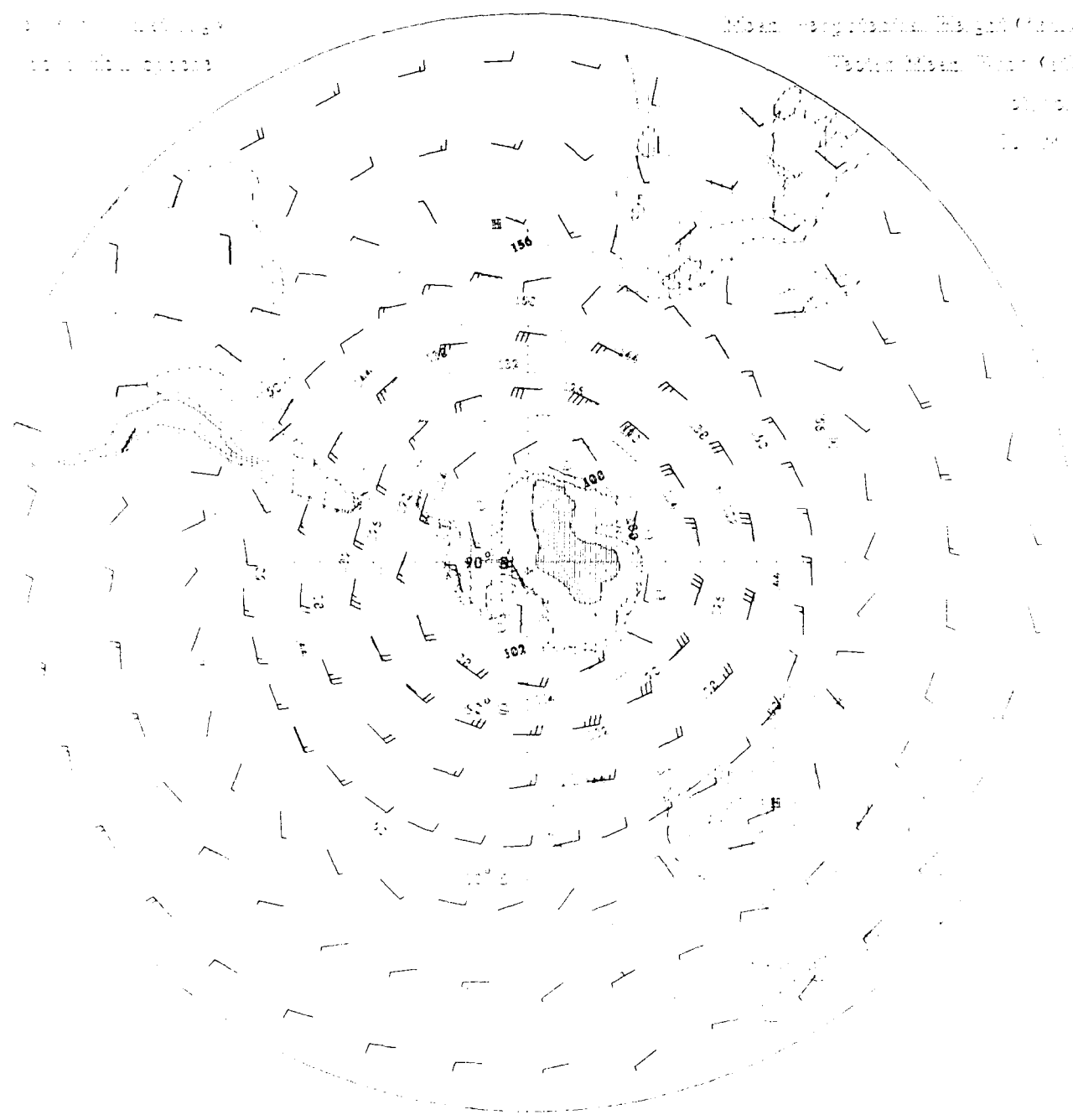
Top of Low Clouds (m)

Mean Sea Level (m)



1. 1000 hPa
2. 500 hPa

Mean Sea Level (m)
Total Mean (m)
2000
1000



Mean Sea Level Height (mms)

Mean Sea Level (msl)

0.0000

0.0000

Wind and Climatology

Northward Hemisphere

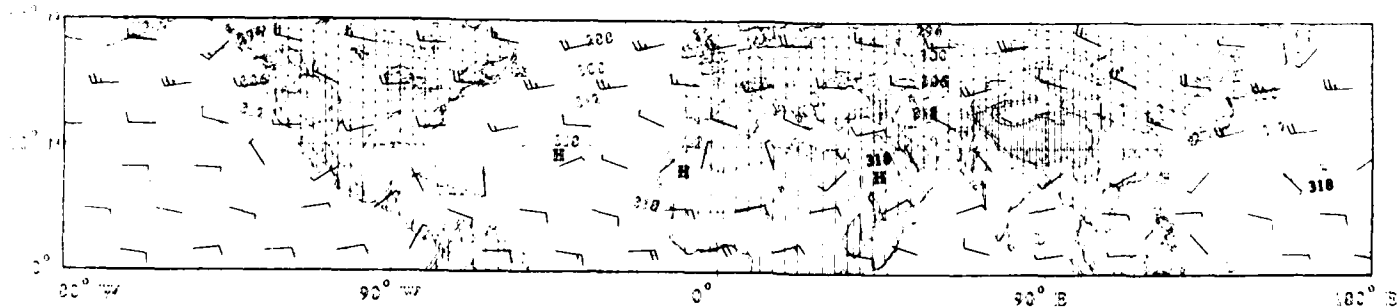
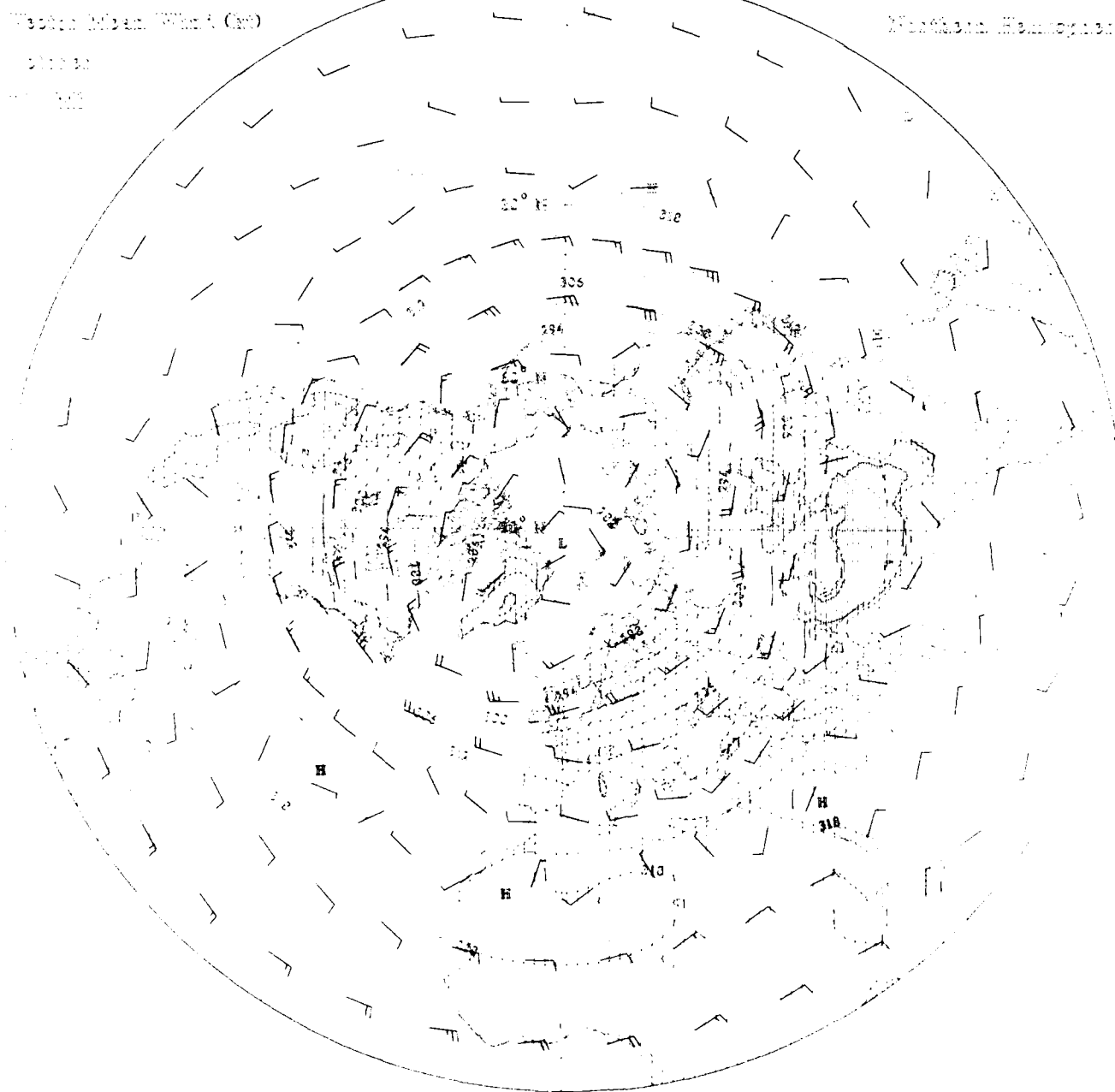


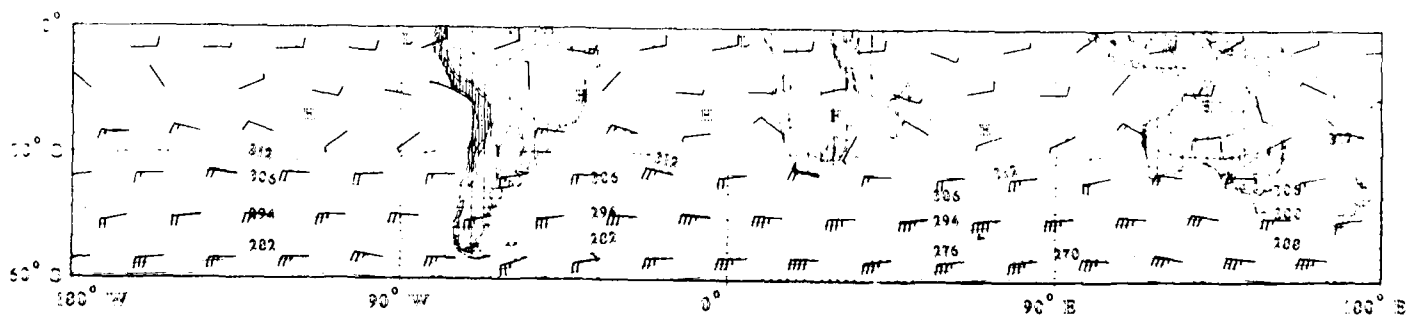
Figure 1. Mean Sea Level
Global Wind Stress

Mean Sea Level Height (m)

Vector Mean Wind (m/s)

Scale

10 m/s



Mean Geopotential Height (ghm)

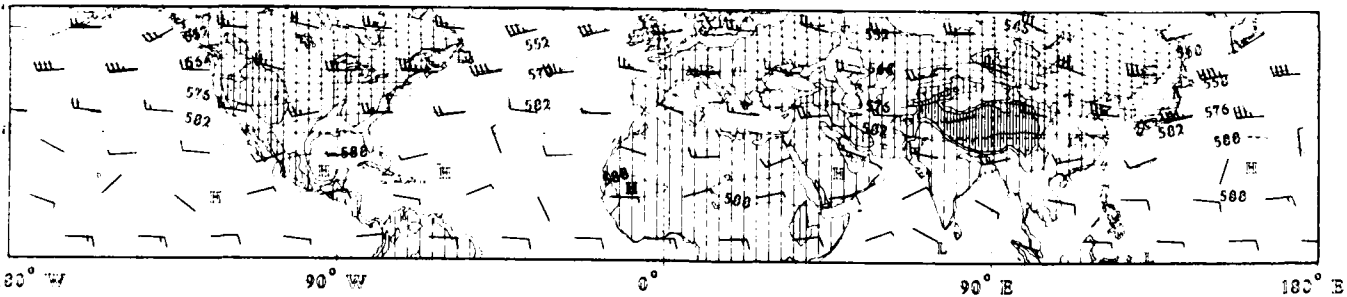
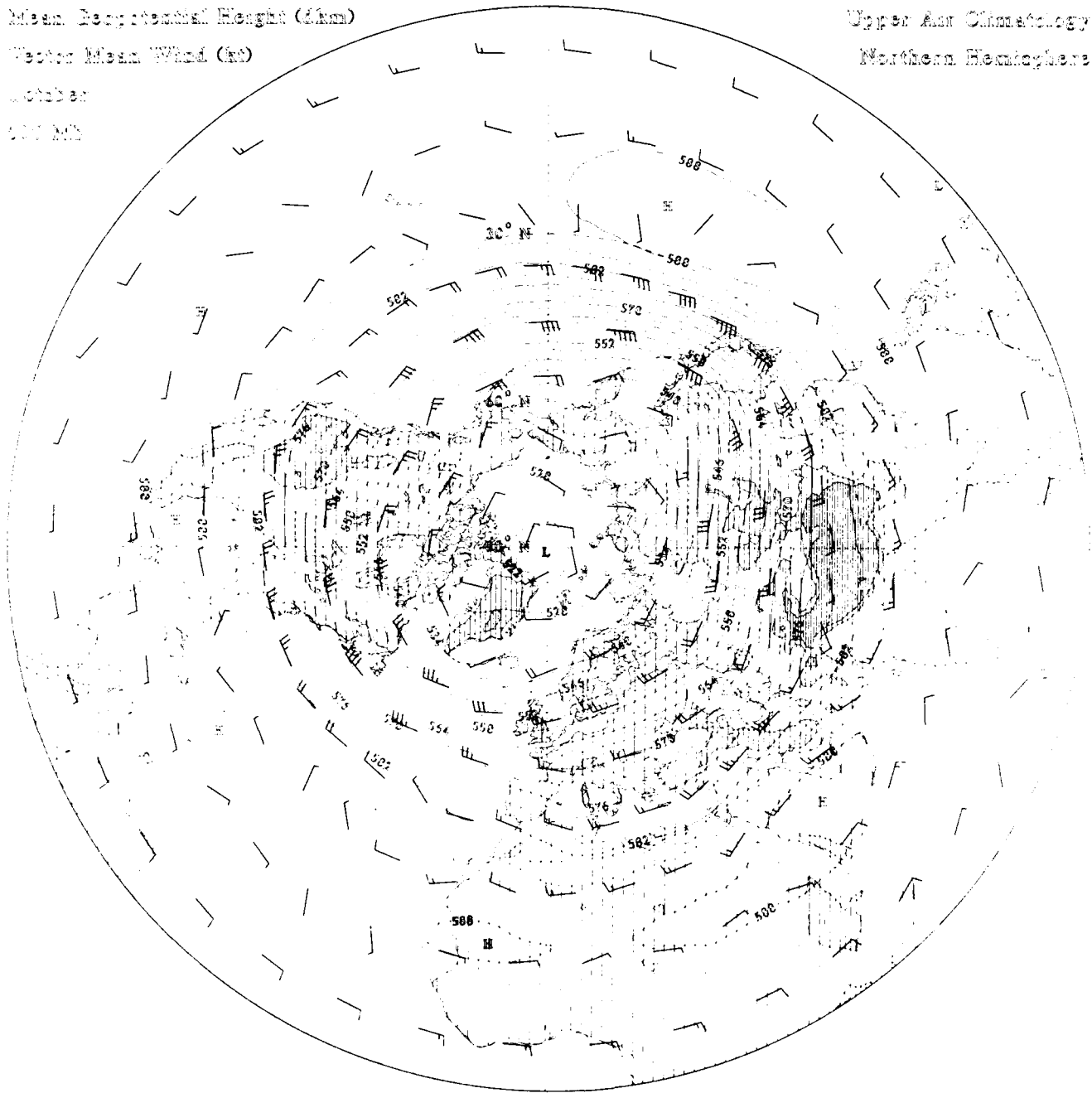
Vector Mean Wind (m)

October

000 UTC

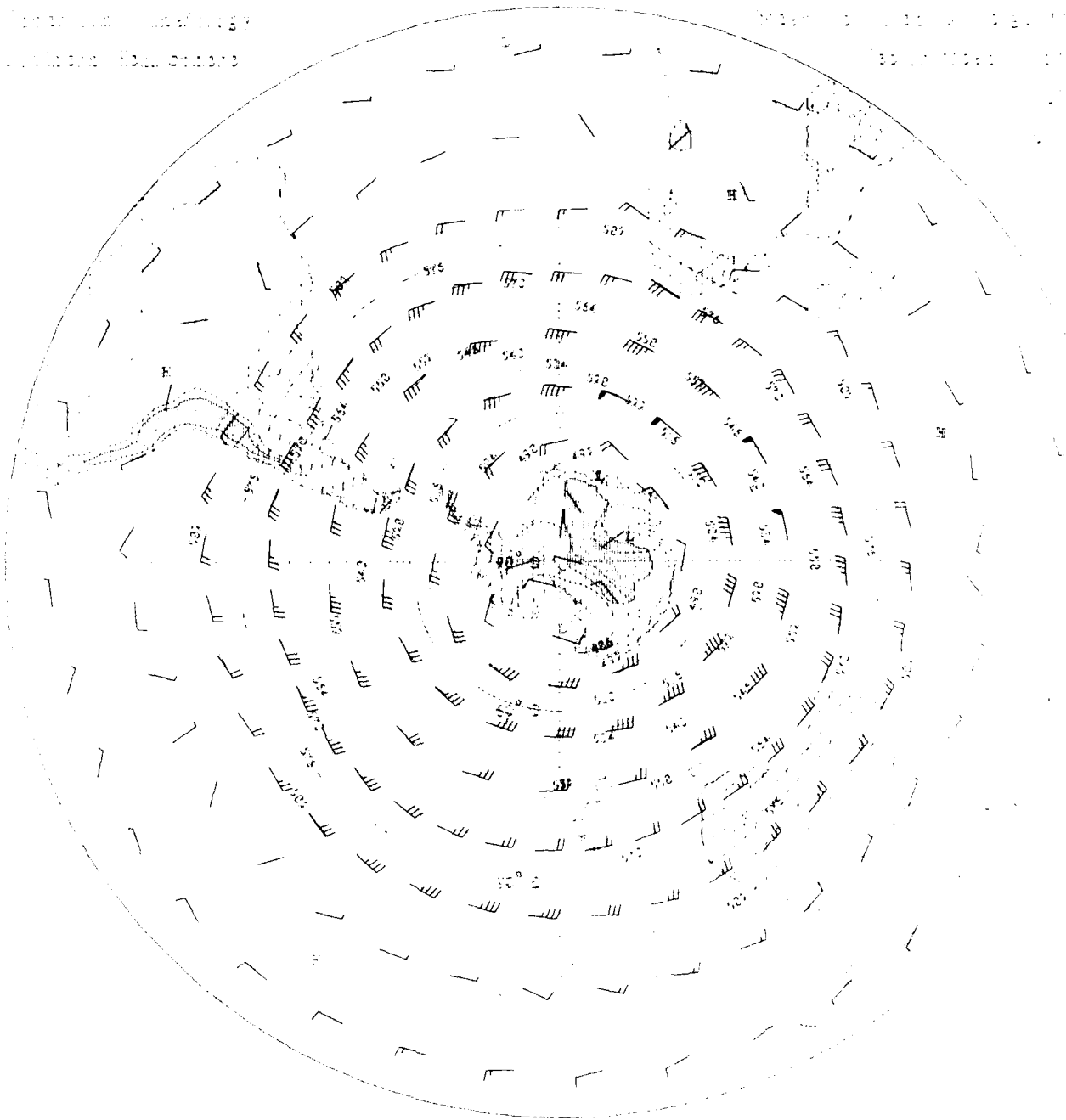
Upper Air Climatology

Northern Hemisphere



1950-1951
 Antarctic Expedition

1950-1951
 Antarctic Expedition
 1950-1951
 1950-1951



Mean Sea Level Height (m)

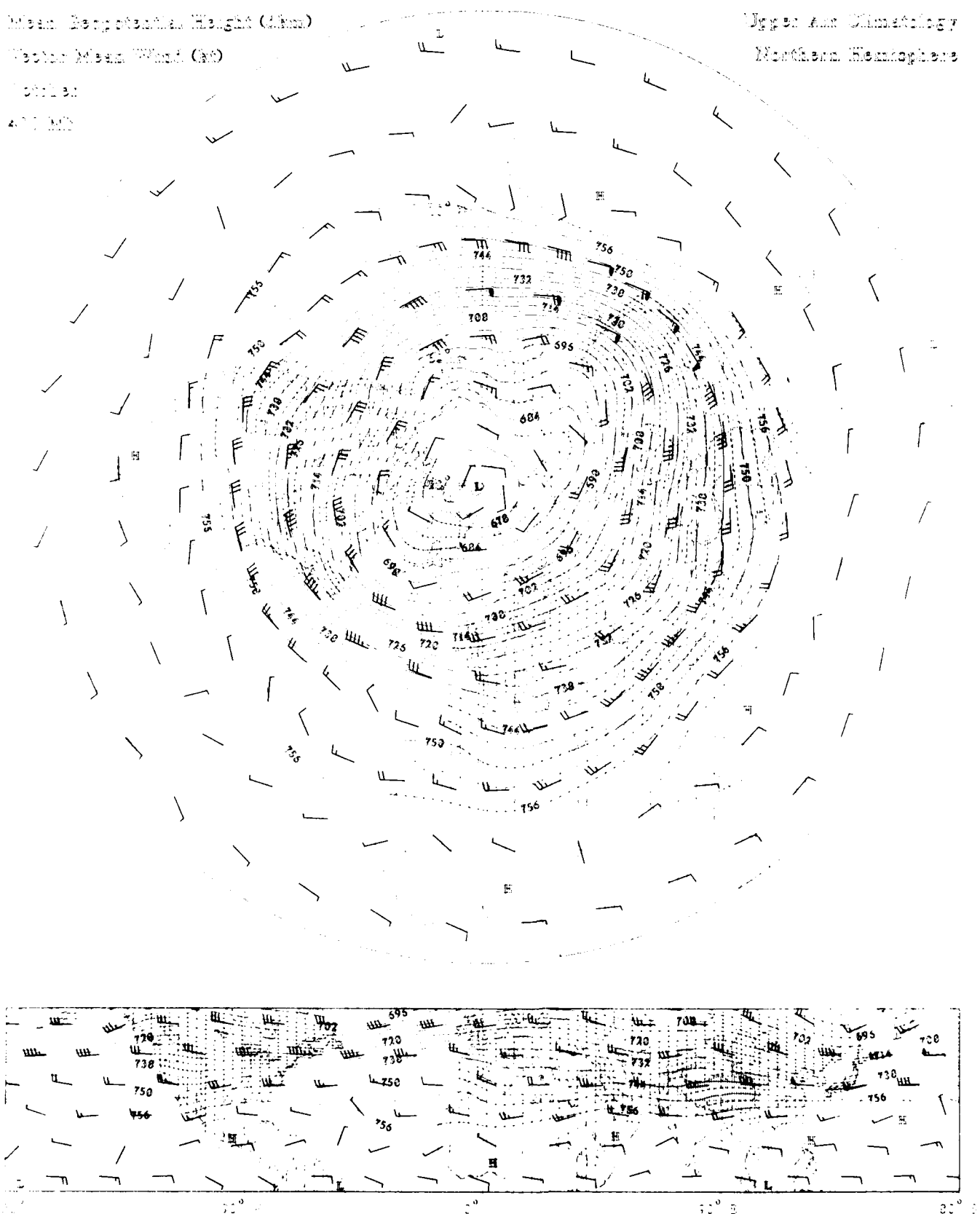
Vector Mean Wind (m)

Series:

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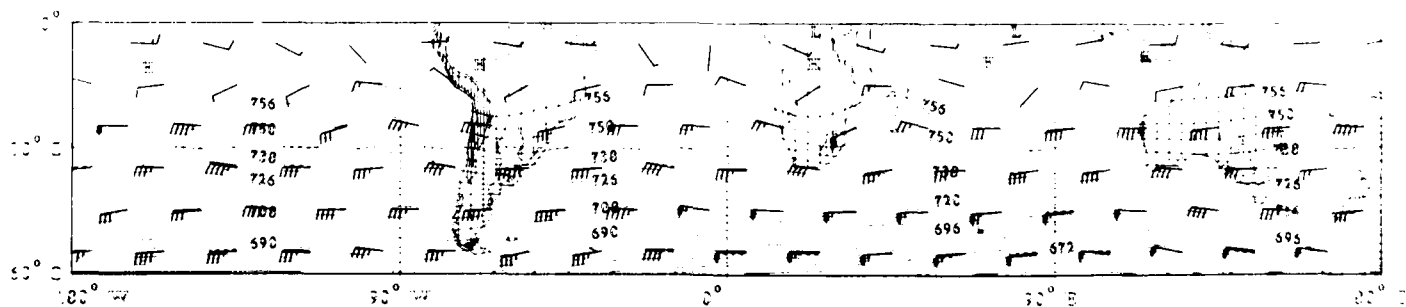
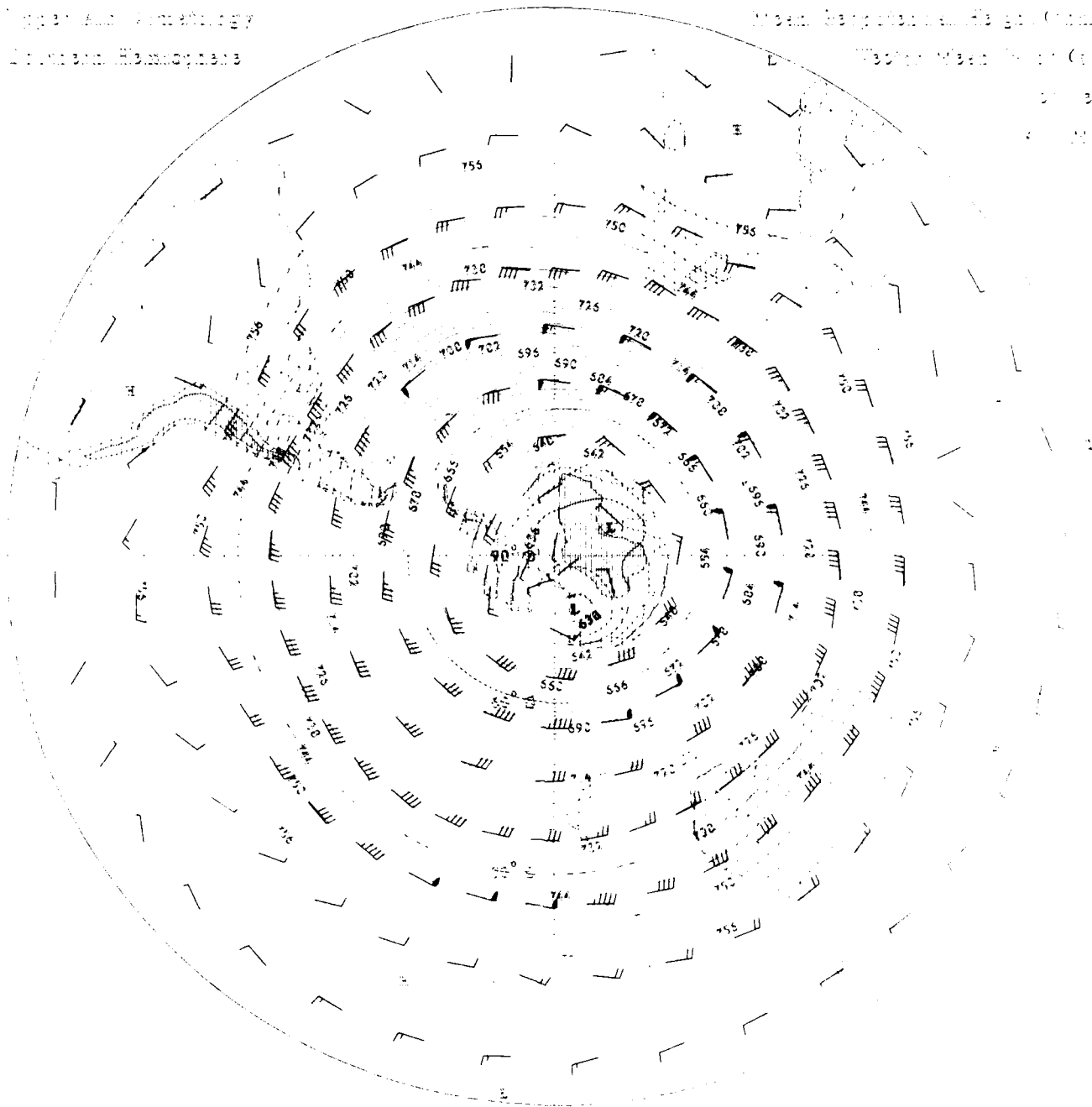
Upper Air Climatology

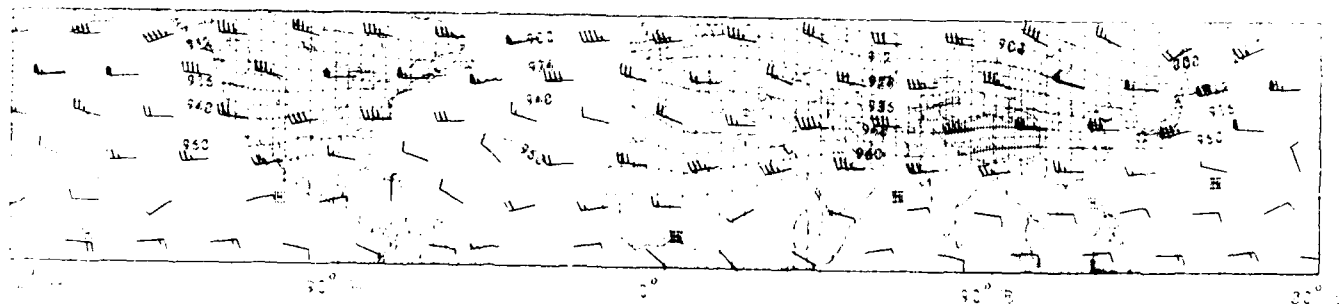
Northern Hemisphere

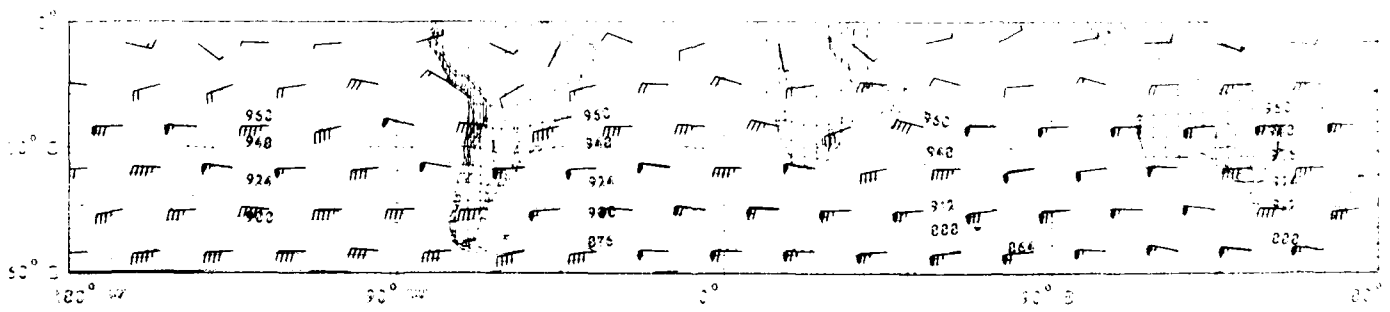
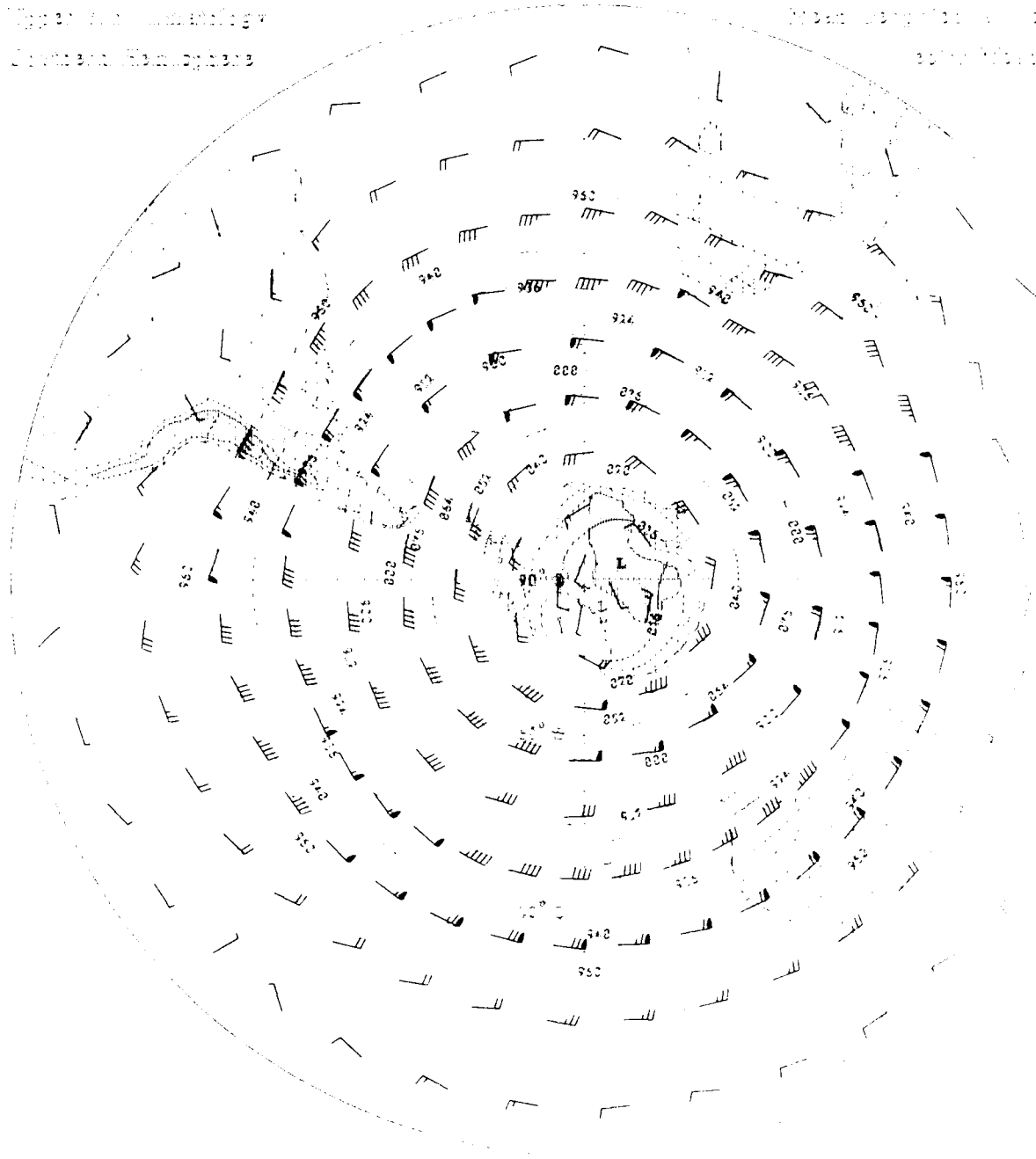


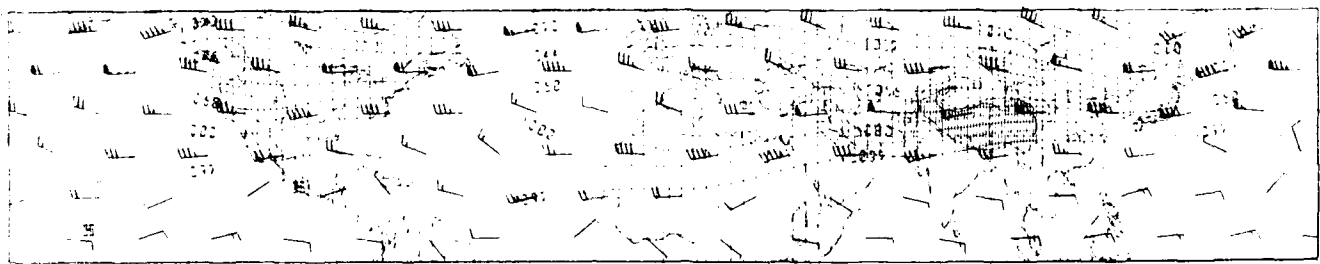
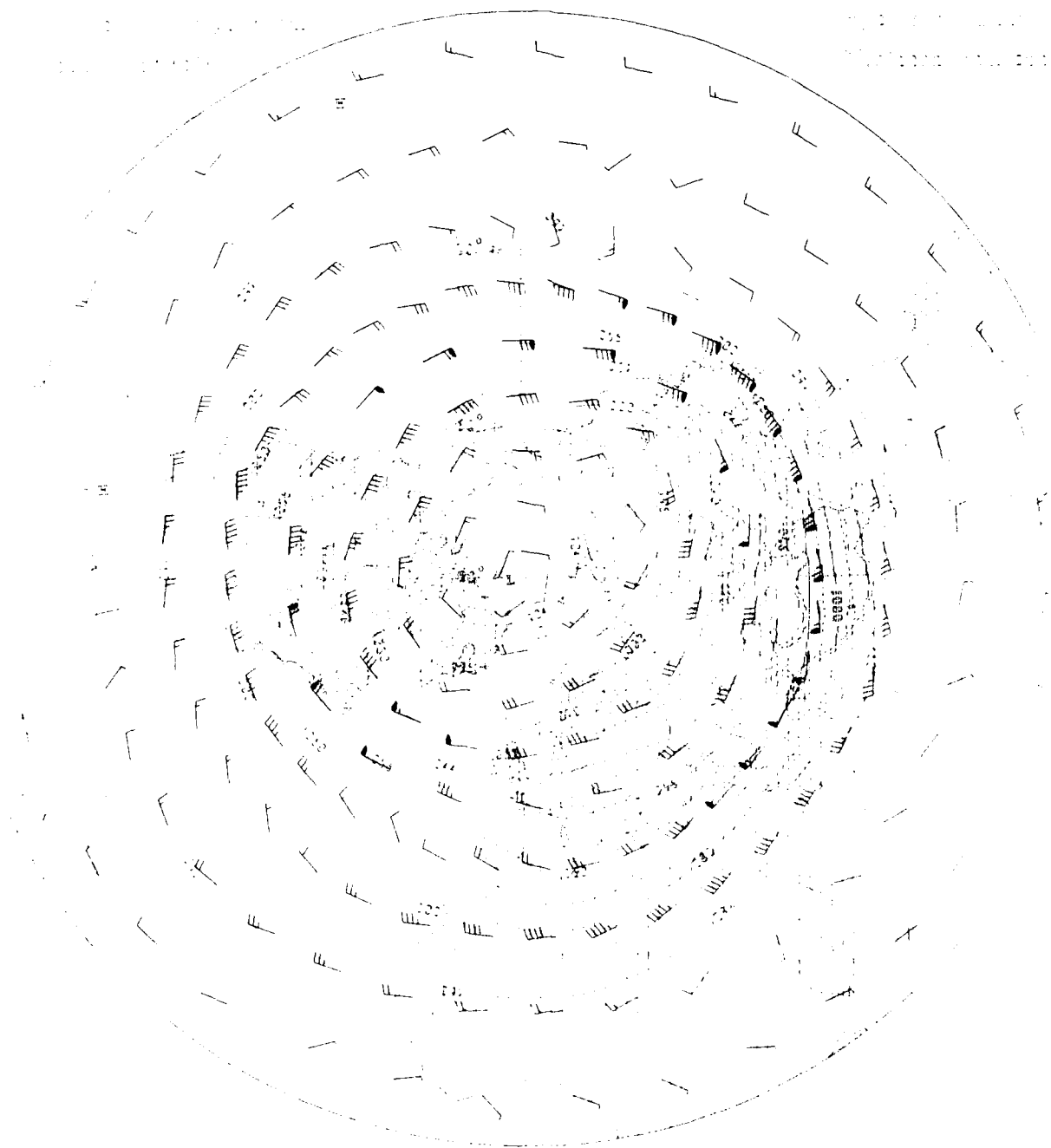
Topography and Hydrography
 of the North Atlantic

Mean Sea Level (MSL) (m)
 7500 Meters (m)



[illegible][illegible]





Typical Annular Symmetry
 Gravitational Anisotropy

Mean Temperature Region (mm.)
 Higher Mean (mm.)
 1000
 1000

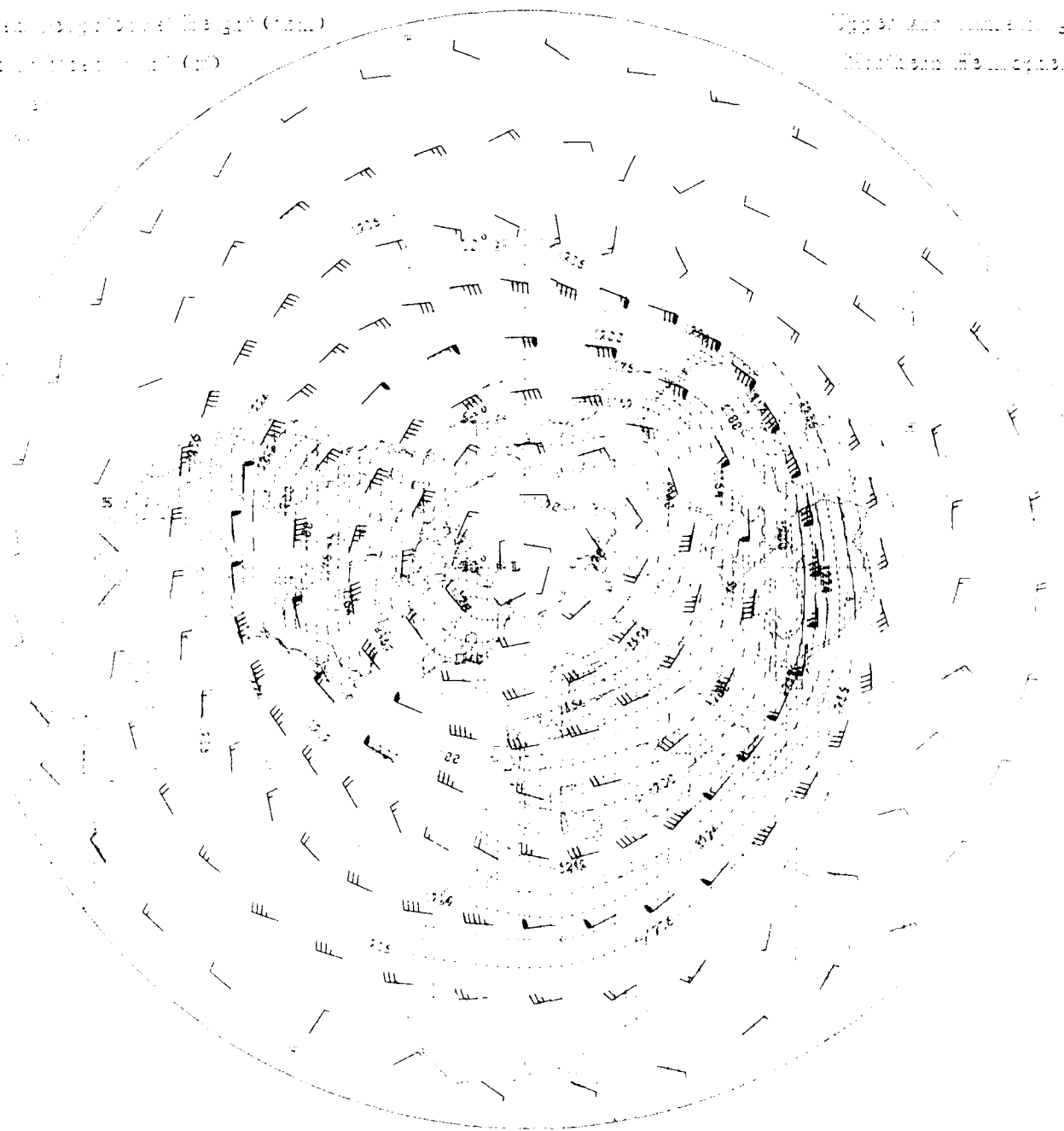


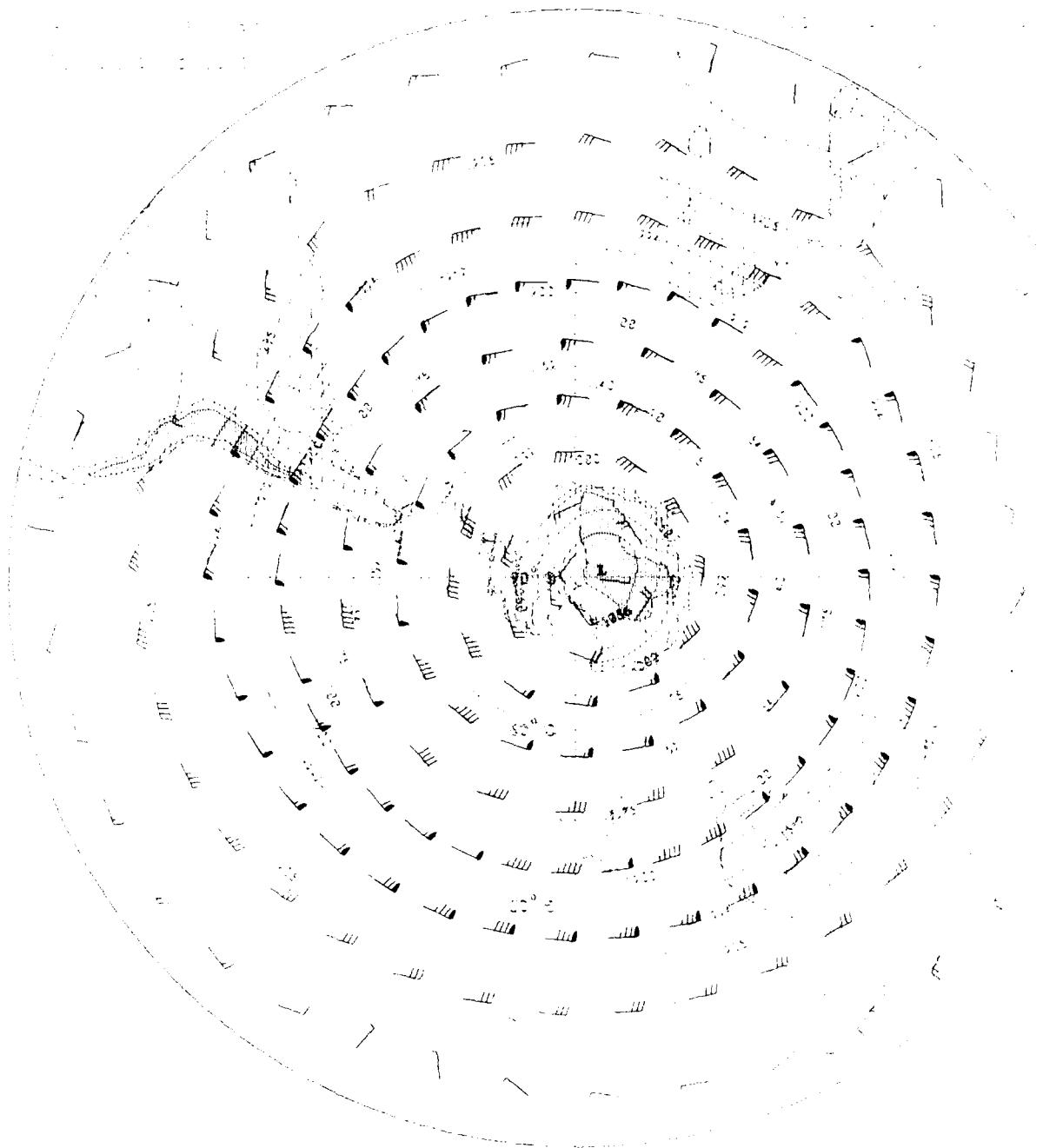
Wind speed (m/s) 10 (10)

Wind direction (°)

Wind speed (m/s) 10 (10)

Wind direction (°)





Mean Sea Level Height (m)

1000 Mean Water (m)

1000

1000

Topographic Contouring

Mean Sea Level

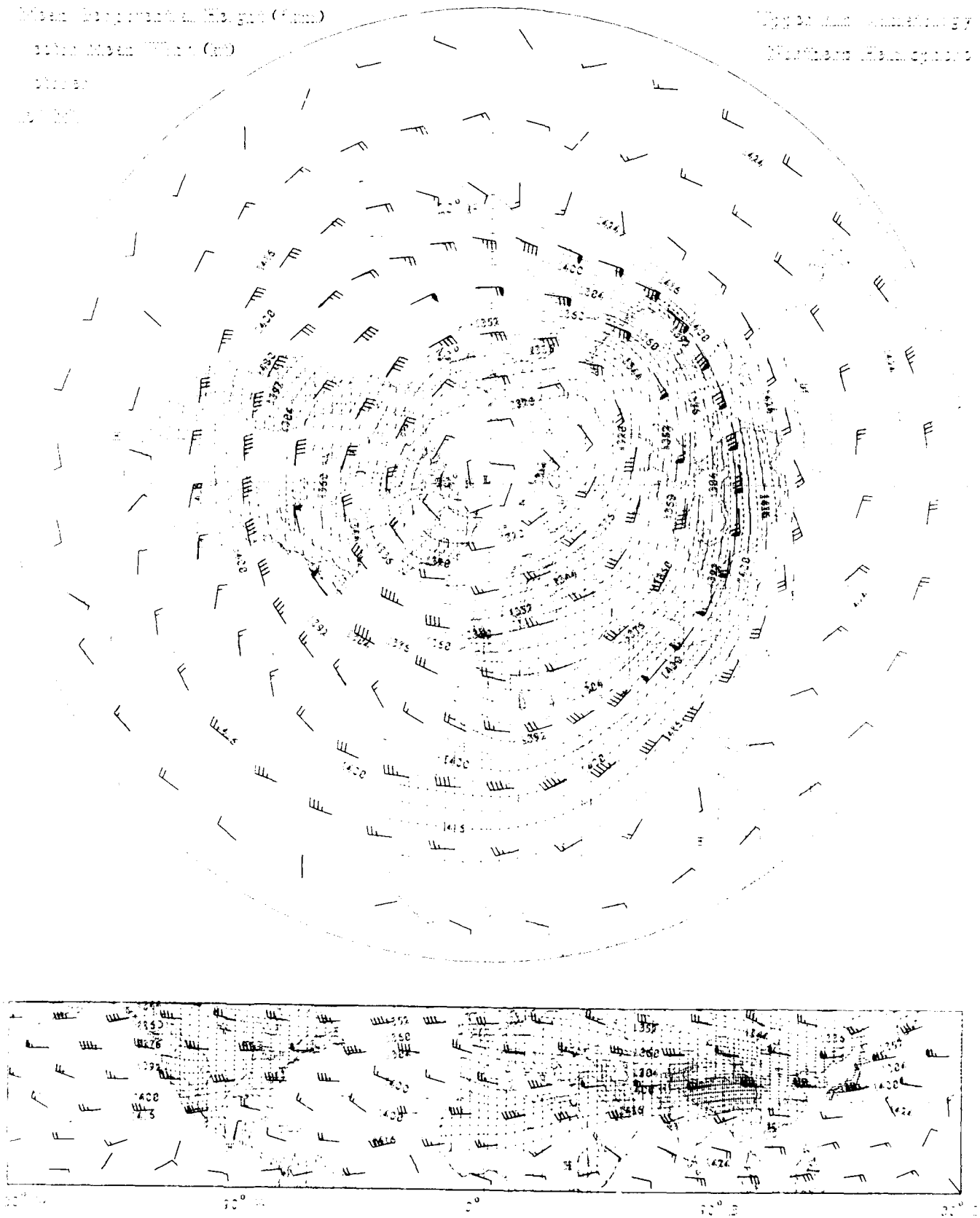


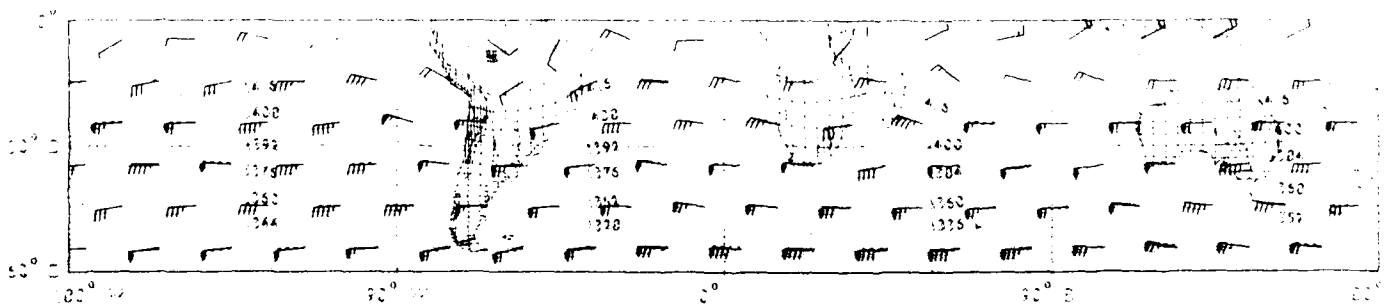
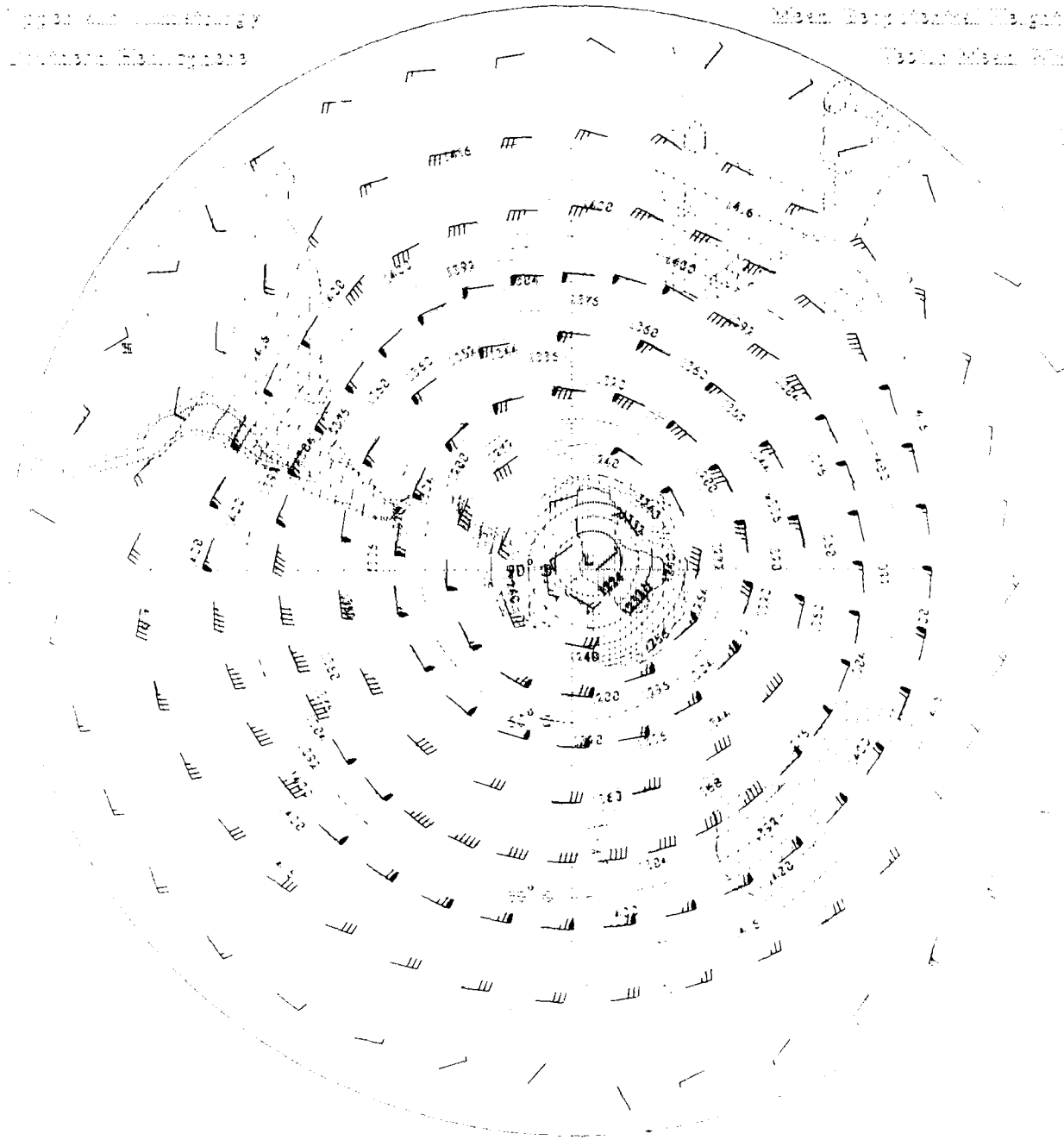
Figure 24. Sea Level Height
and Sea Level Pressure

Mean Sea Level Height (m)

Mean Sea Level Pressure (hPa)

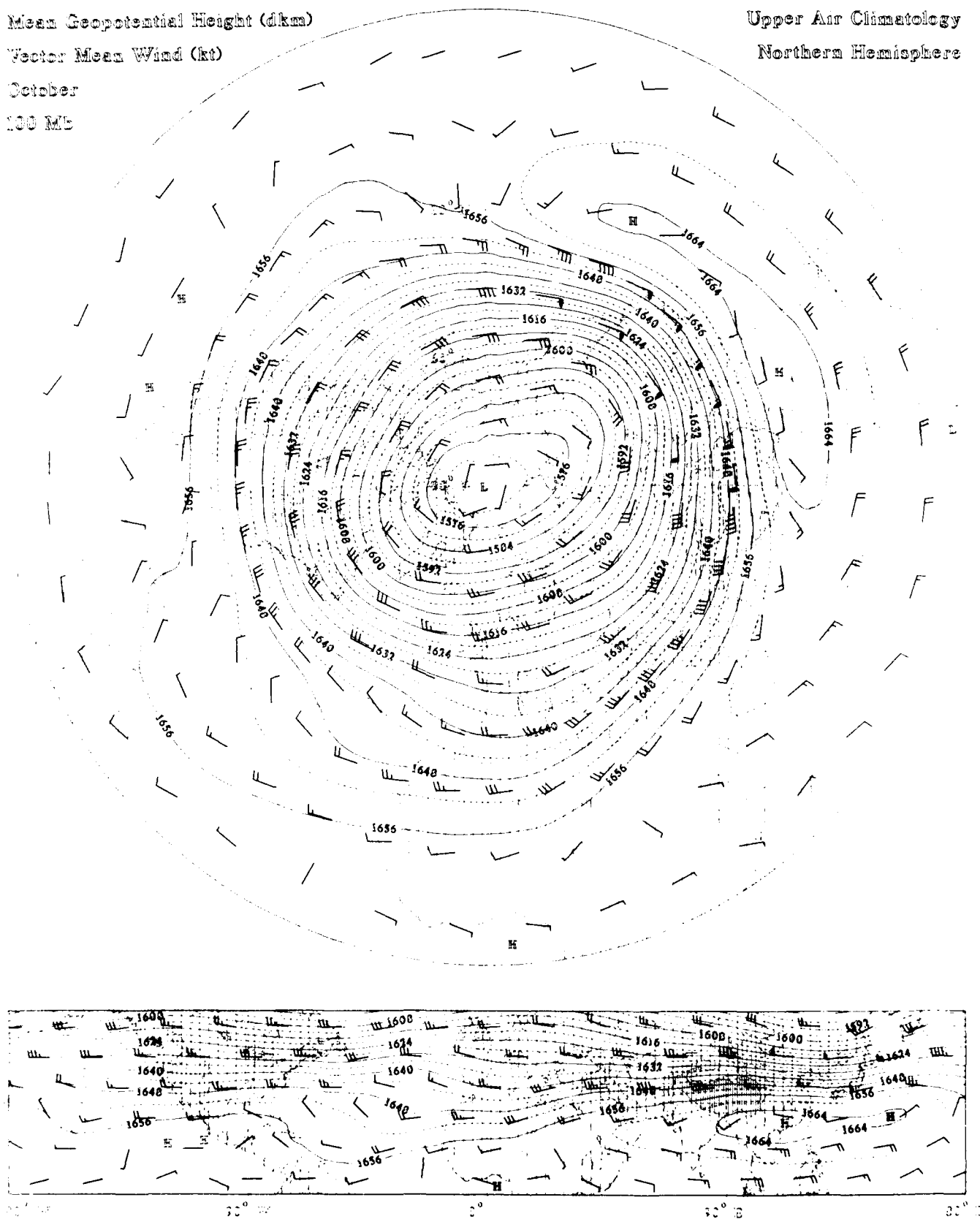
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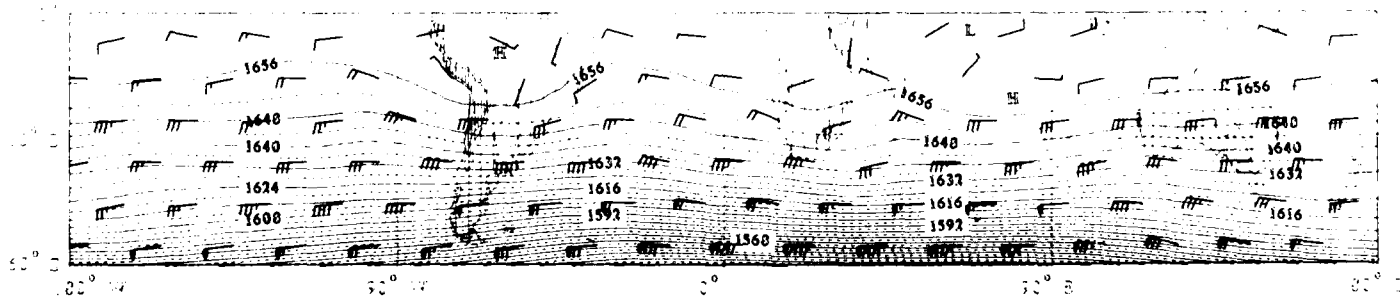
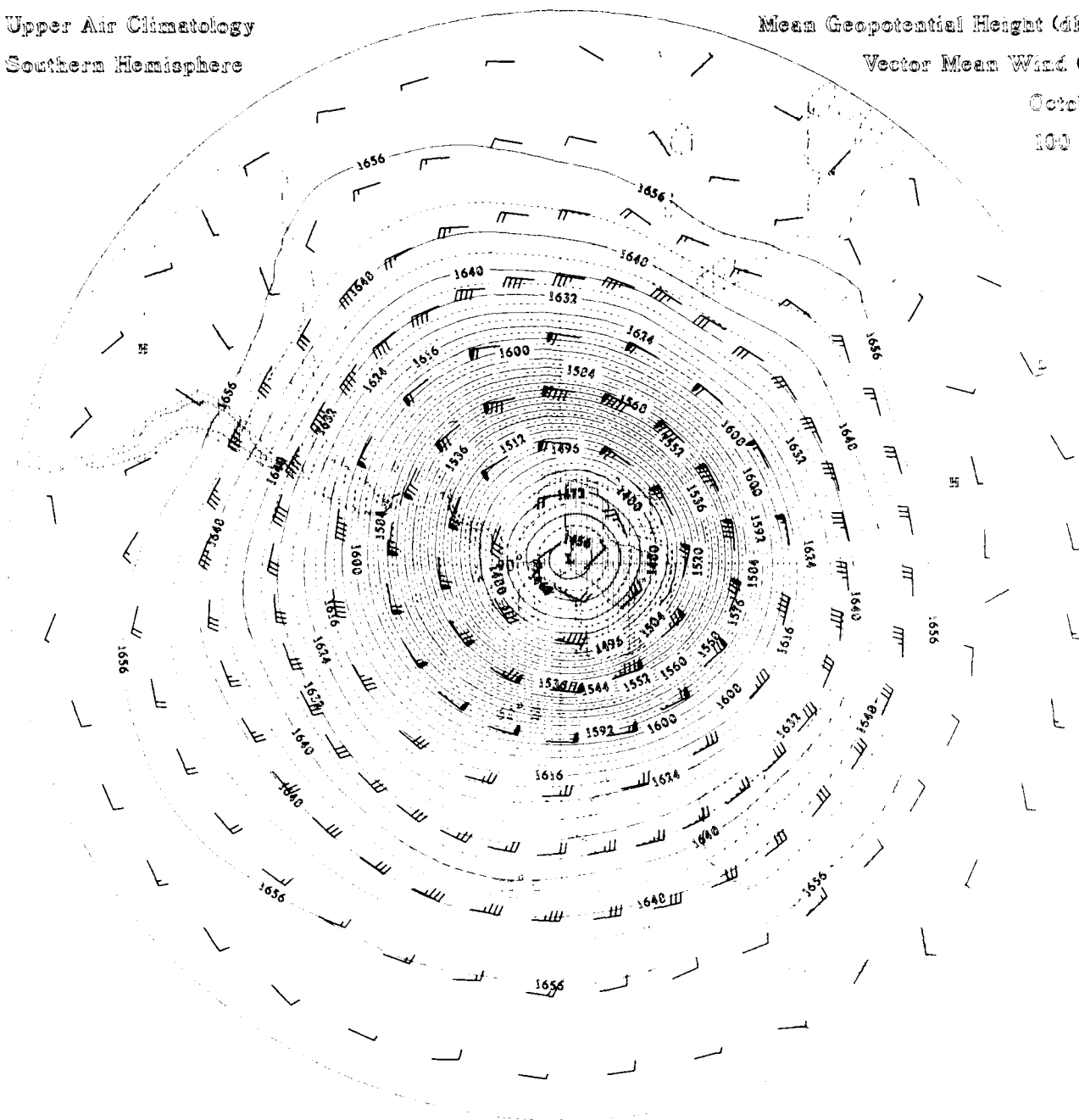
Mean Geopotential Height (dkm)
 Vector Mean Wind (kt)
 October
 100 MB

Upper Air Climatology
 Northern Hemisphere



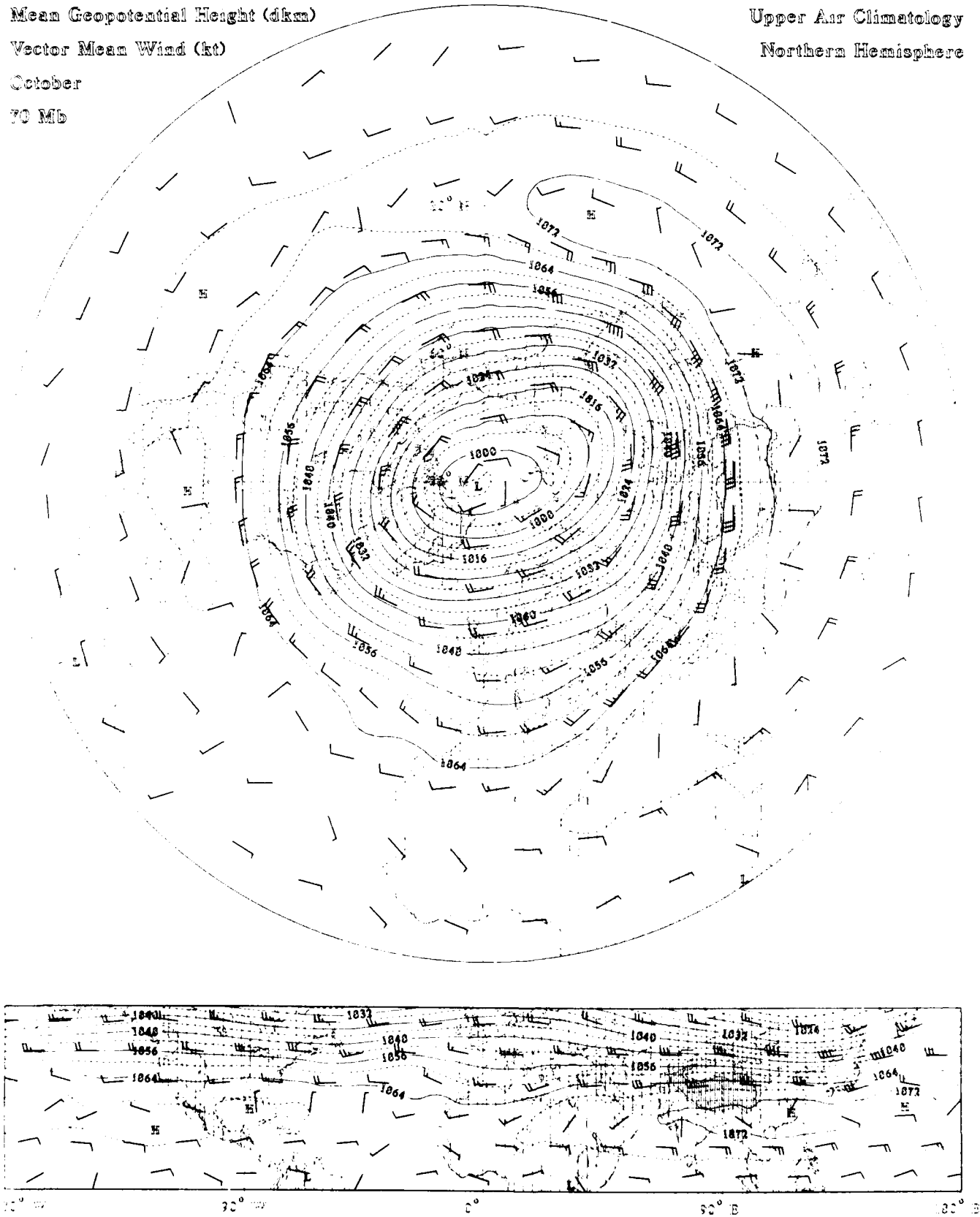
Upper Air Climatology
Southern Hemisphere

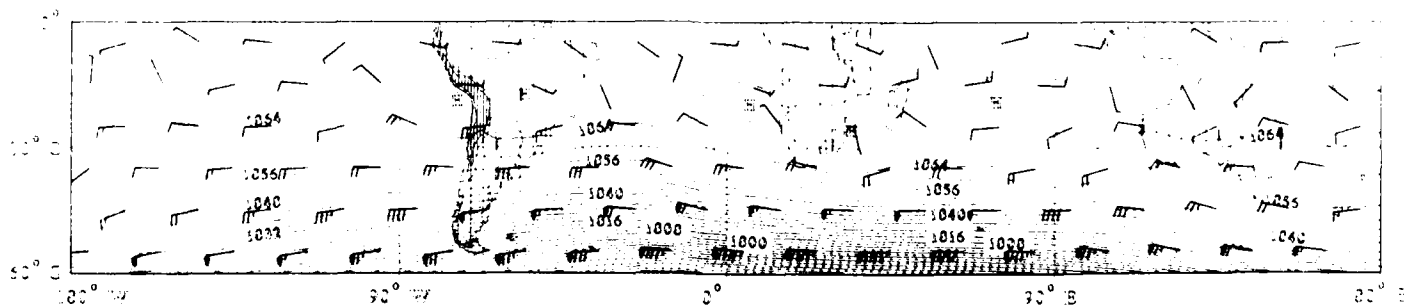
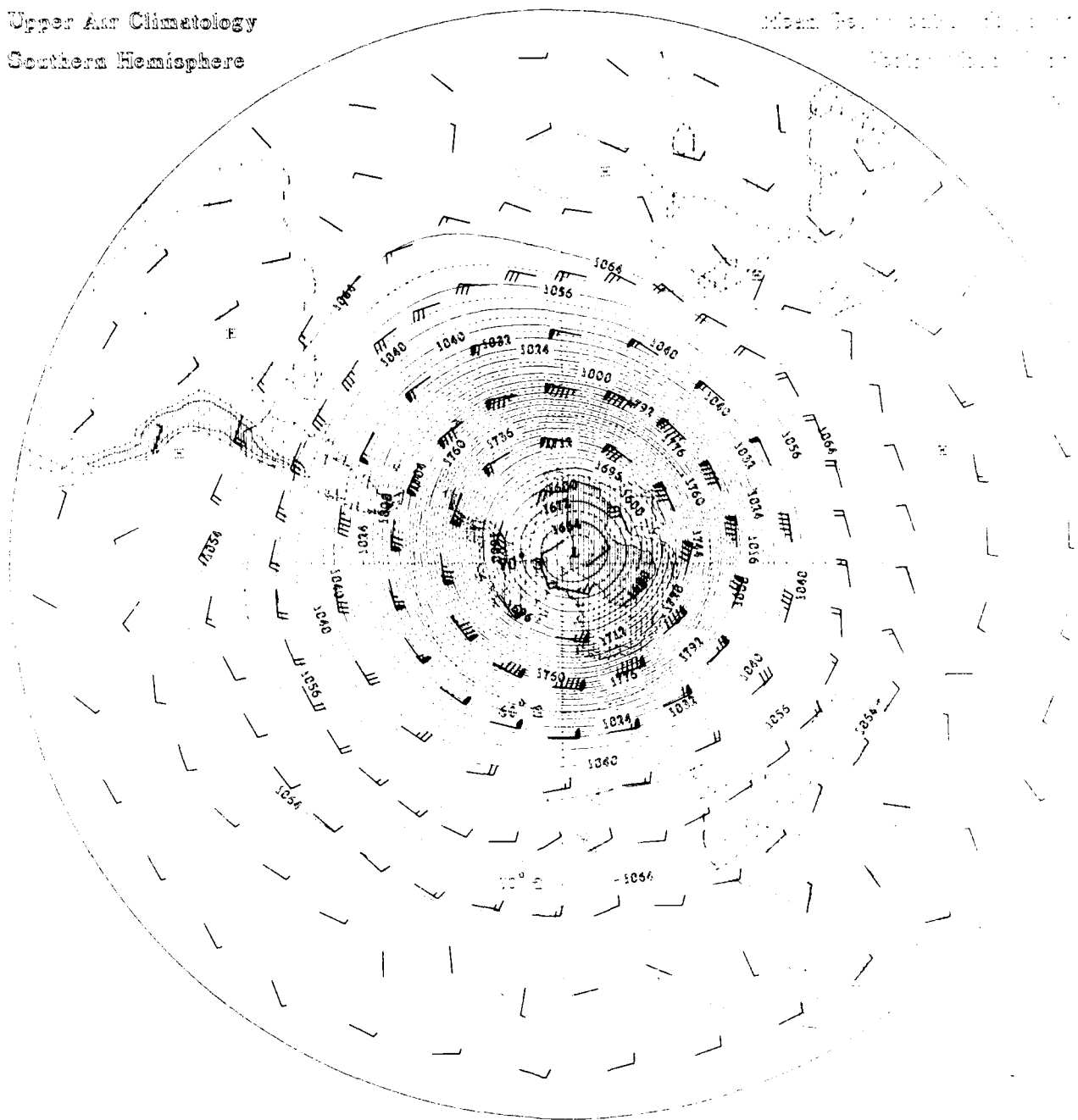
Mean Geopotential Height (dkm)
Vector Mean Wind (kt)
October
100 MB



Mean Geopotential Height (dkm)
 Vector Mean Wind (kt)
 October
 70 Mb

Upper Air Climatology
 Northern Hemisphere



[illegible]

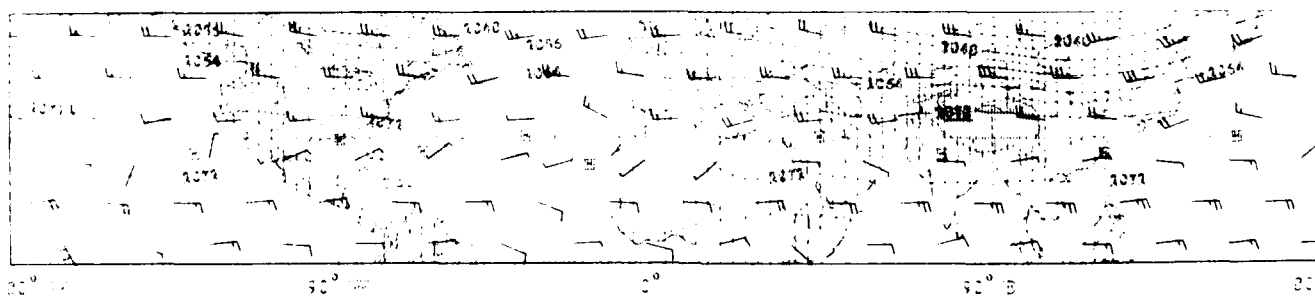
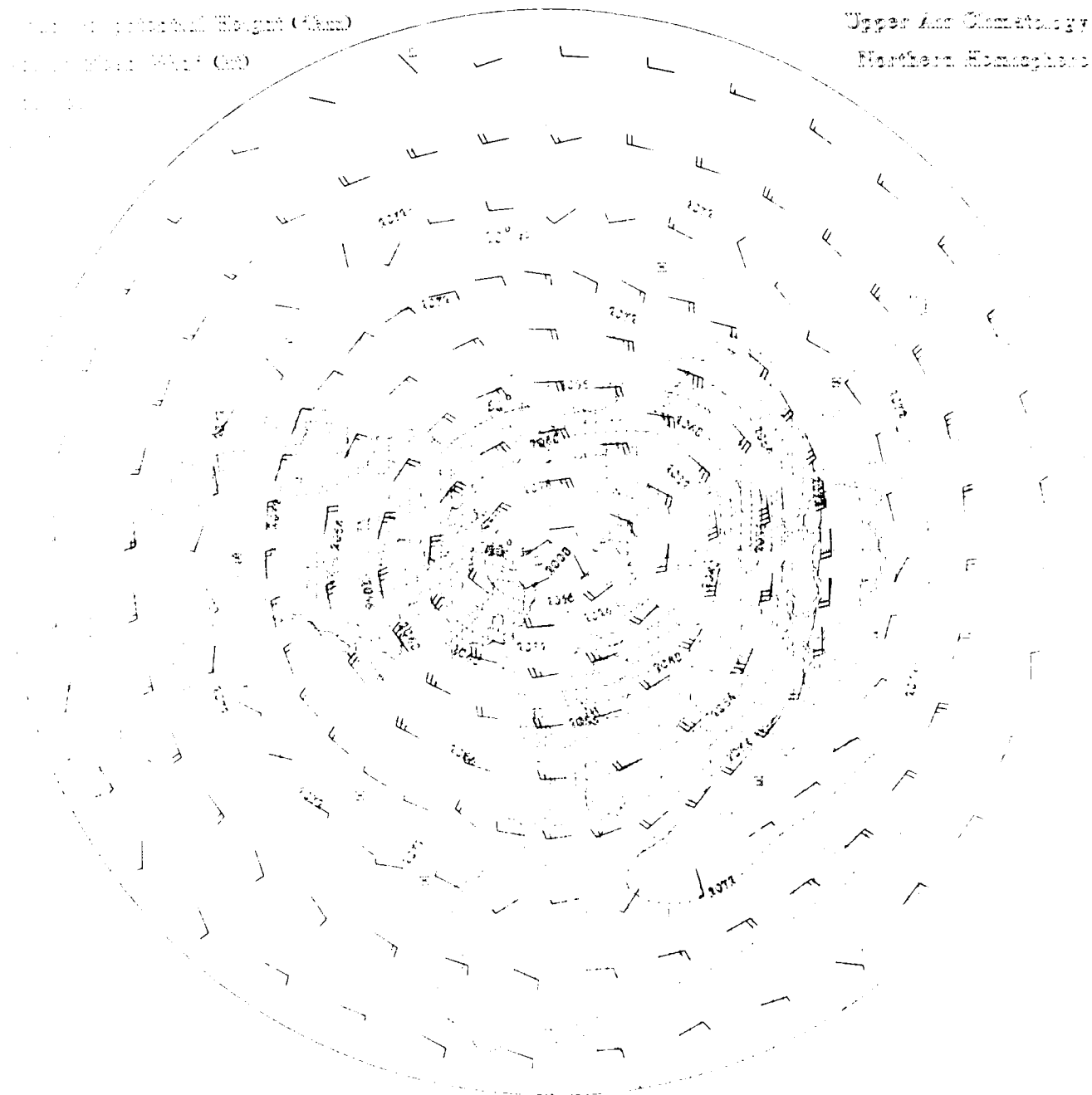
Geopotential Height (Gm)

Geopotential (Gm)

1000

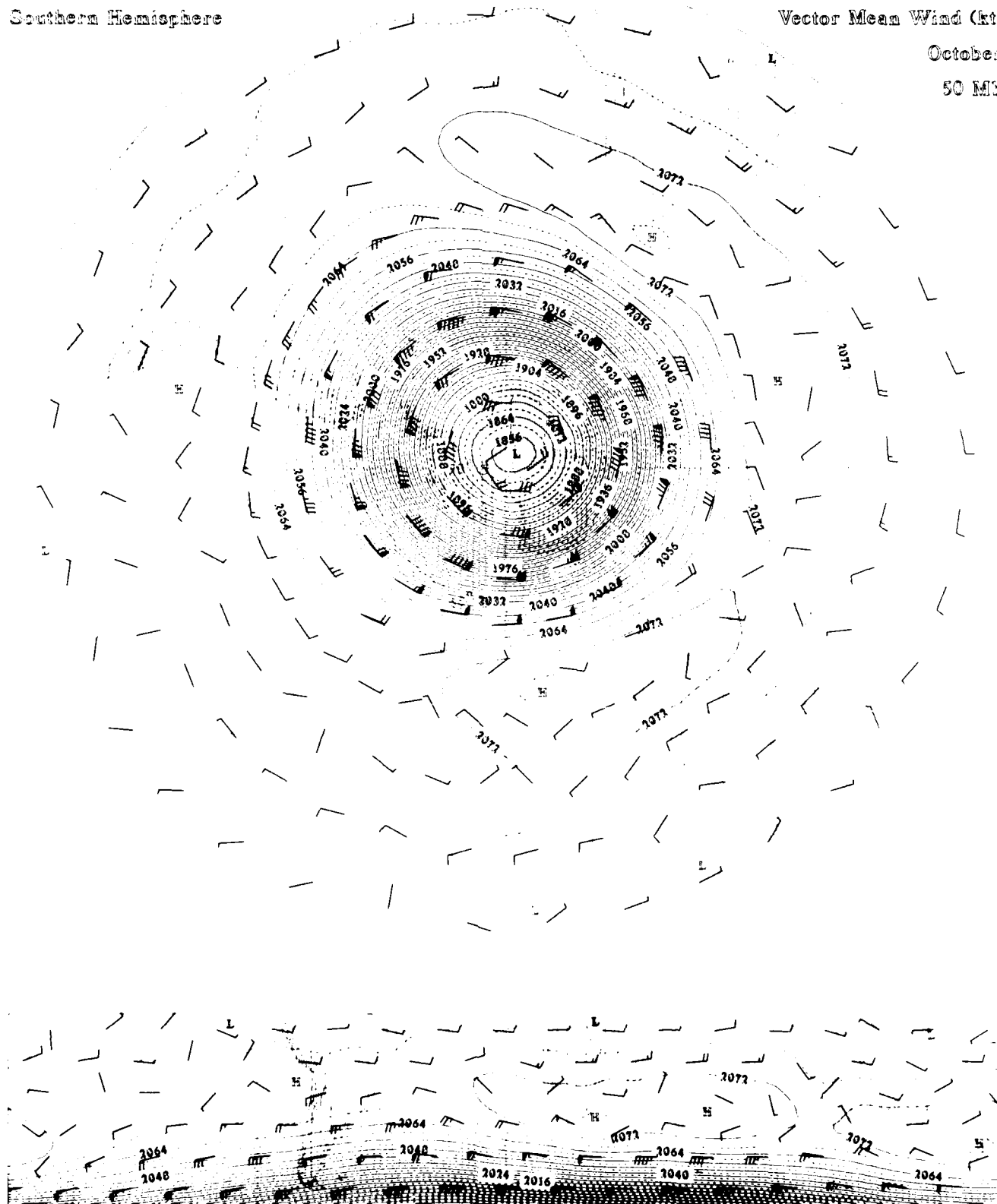
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Geopotential Height (gkm)
Vector Mean Wind (kt)
October
50 Mb



Mean Geopotential Height (dkm)

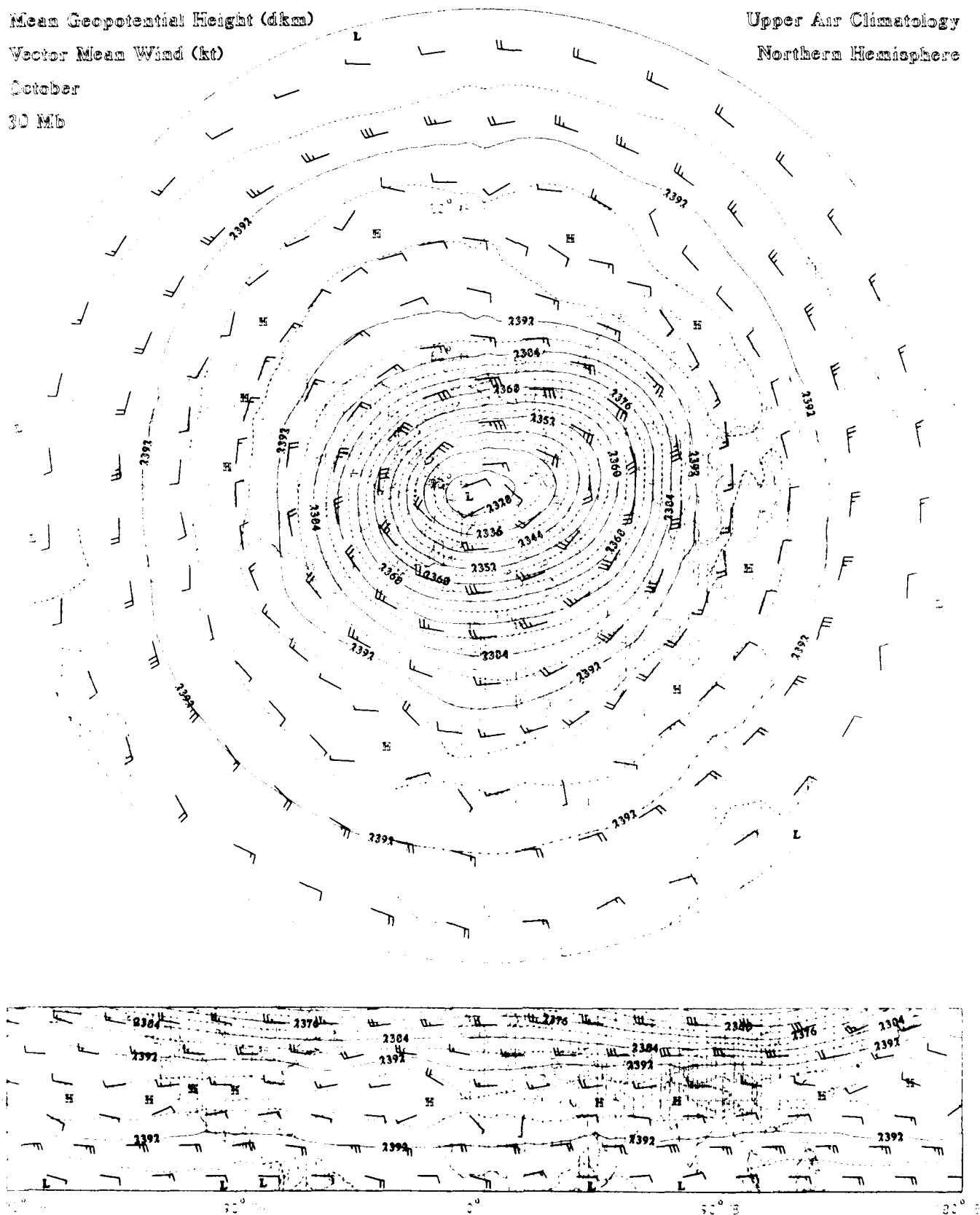
Vector Mean Wind (kt)

October

30 Mb

Upper Air Climatology

Northern Hemisphere



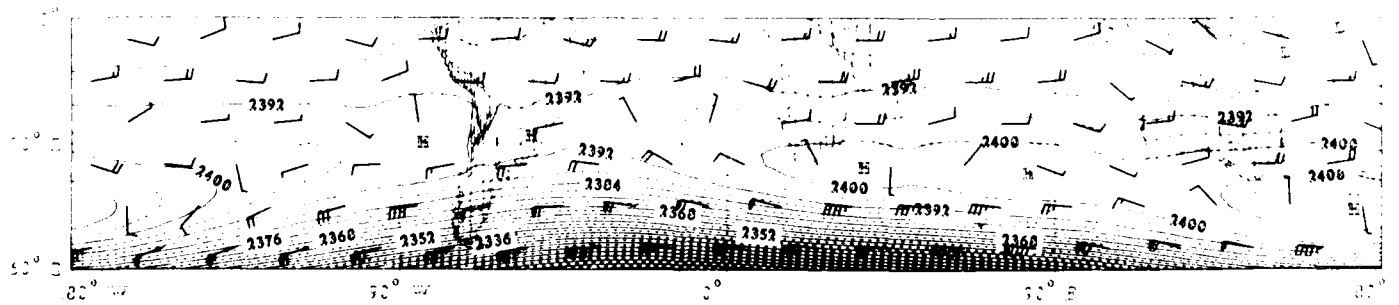
Upper Air Climatology
Southern Hemisphere

Mean Geopotential Height (gpm)

Vector Mean Wind (m/s)

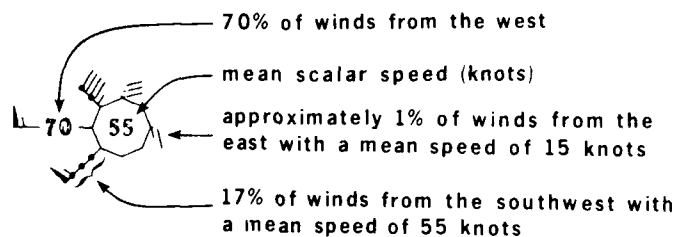
Contour

10 gpm

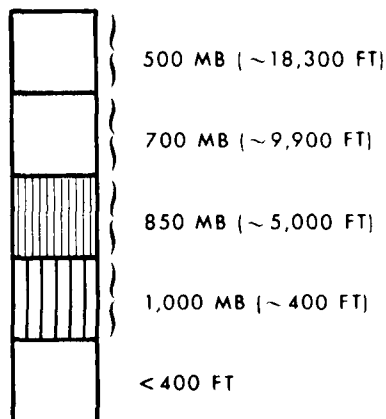


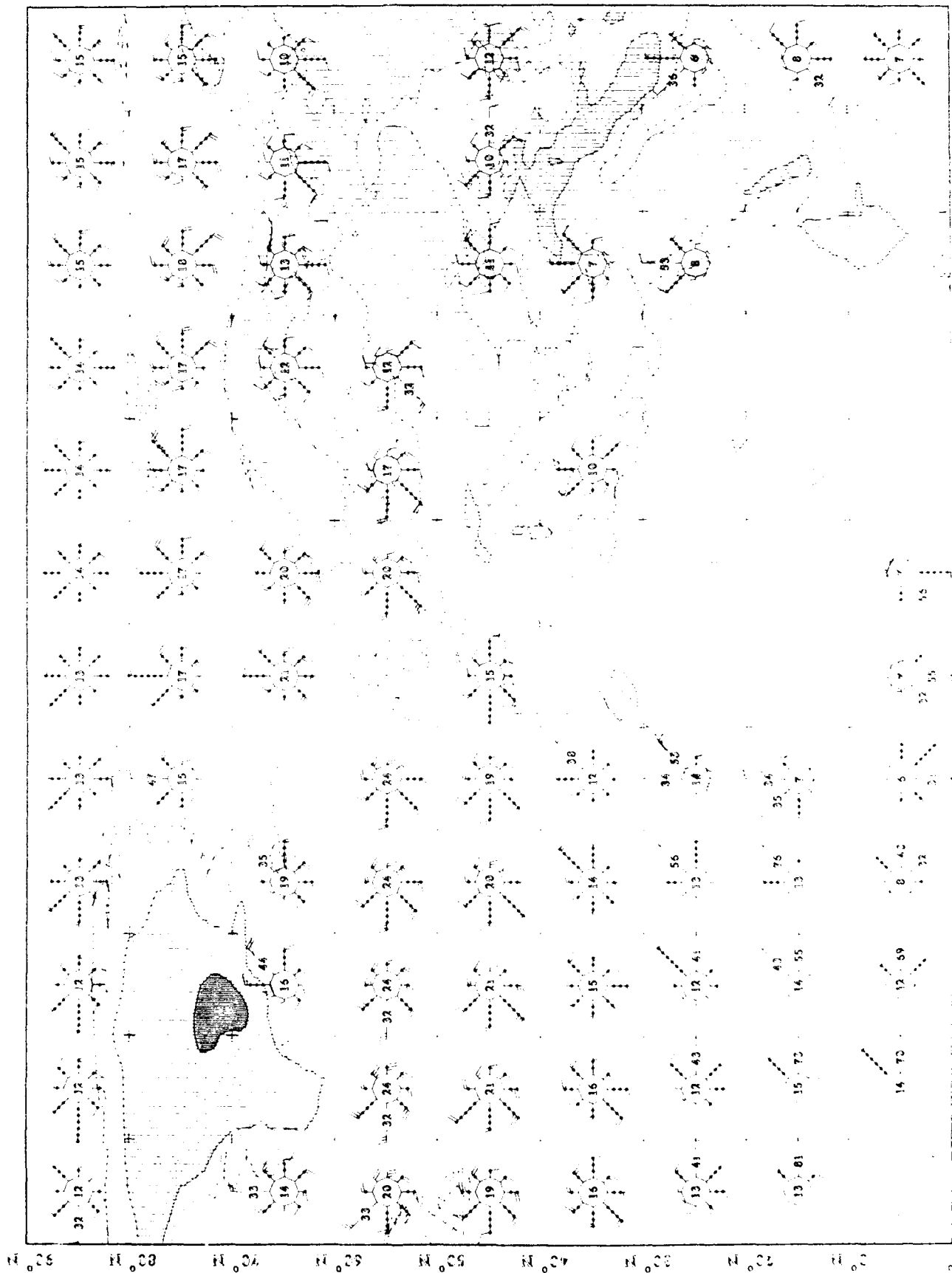
WIND ROSES (13 LEVELS, 1000 TO 30 MB)

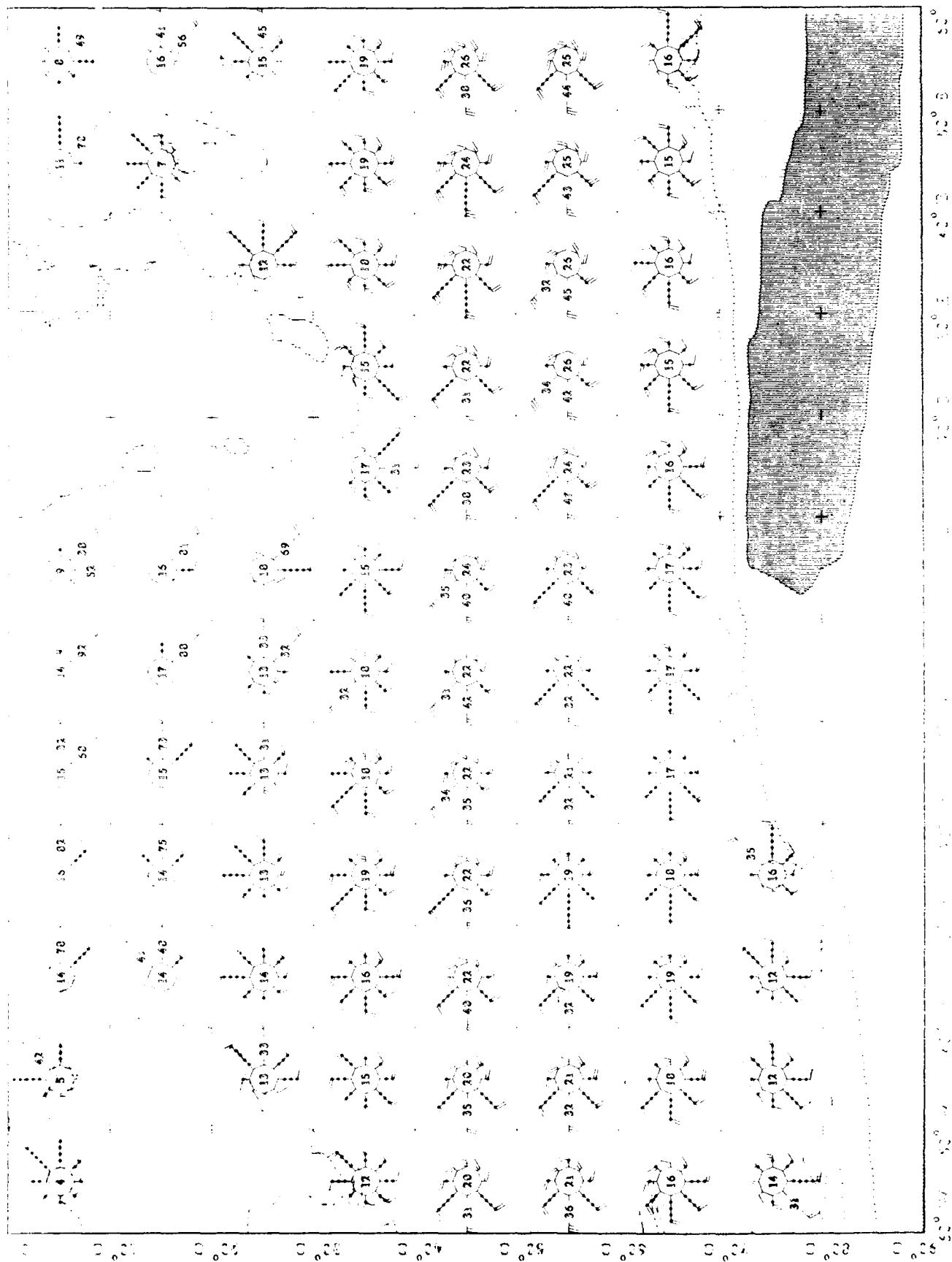
- Wind roses at 10 degree latitude/longitude grid points
- Directional mean wind speed in 5 knot increments
- Frequency proportional to barb length with individual dots representing 5% increments. Values greater than 30% are plotted directly on the barb.
- Roses blanked at grid points with elevations exceeding specified geopotential heights.
- Sample rose explanation:

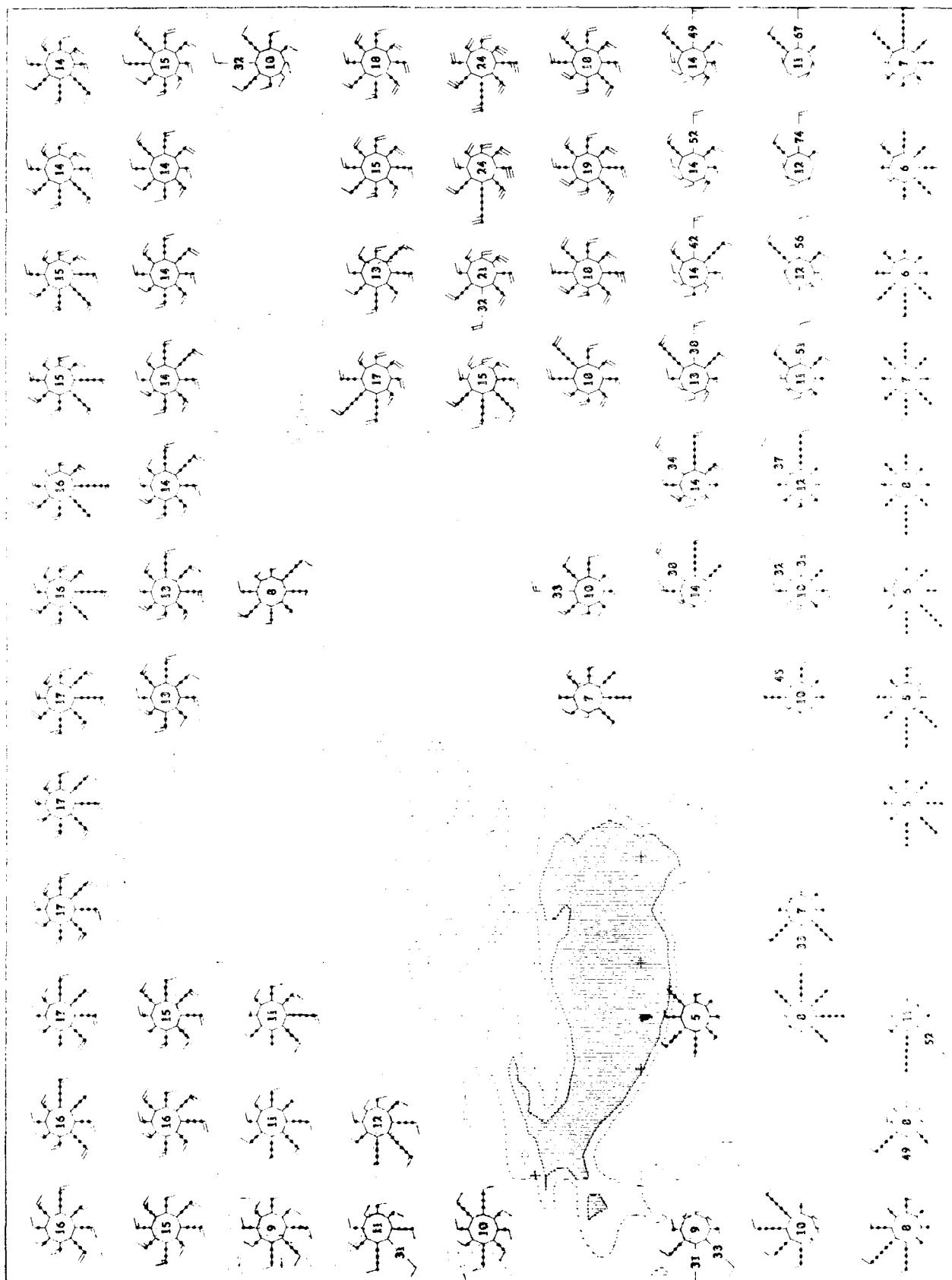


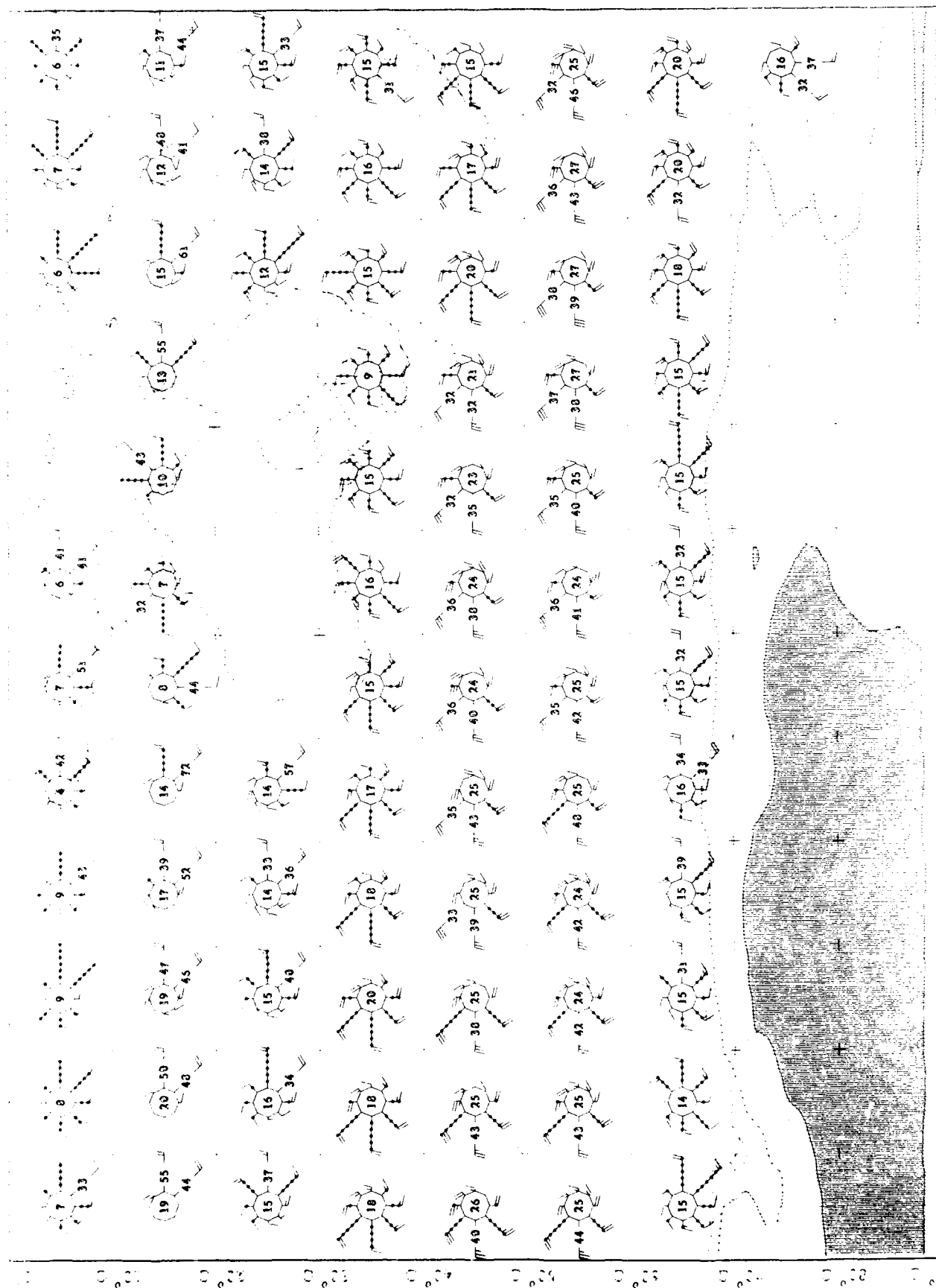
ELEVATION SCALE

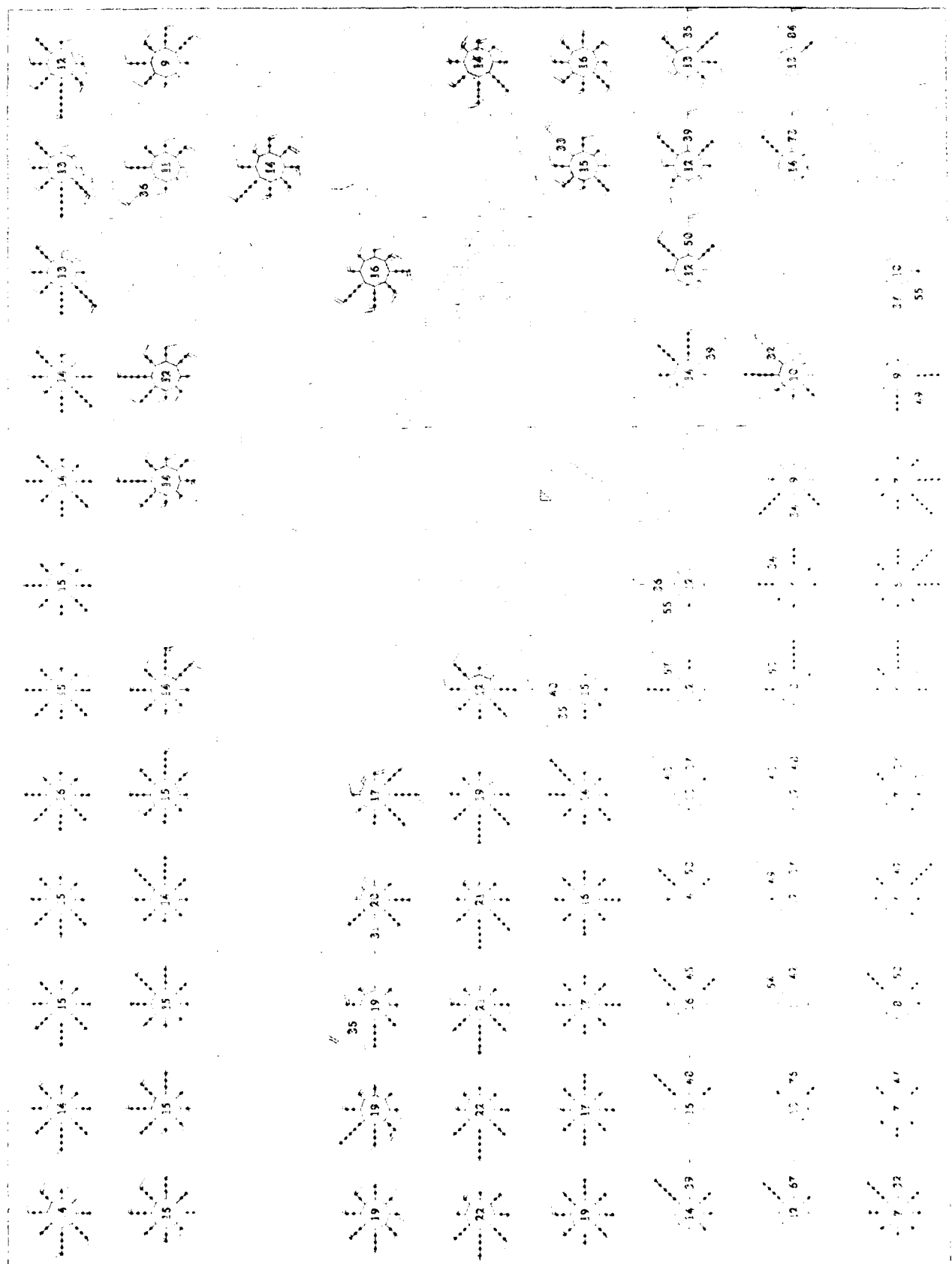


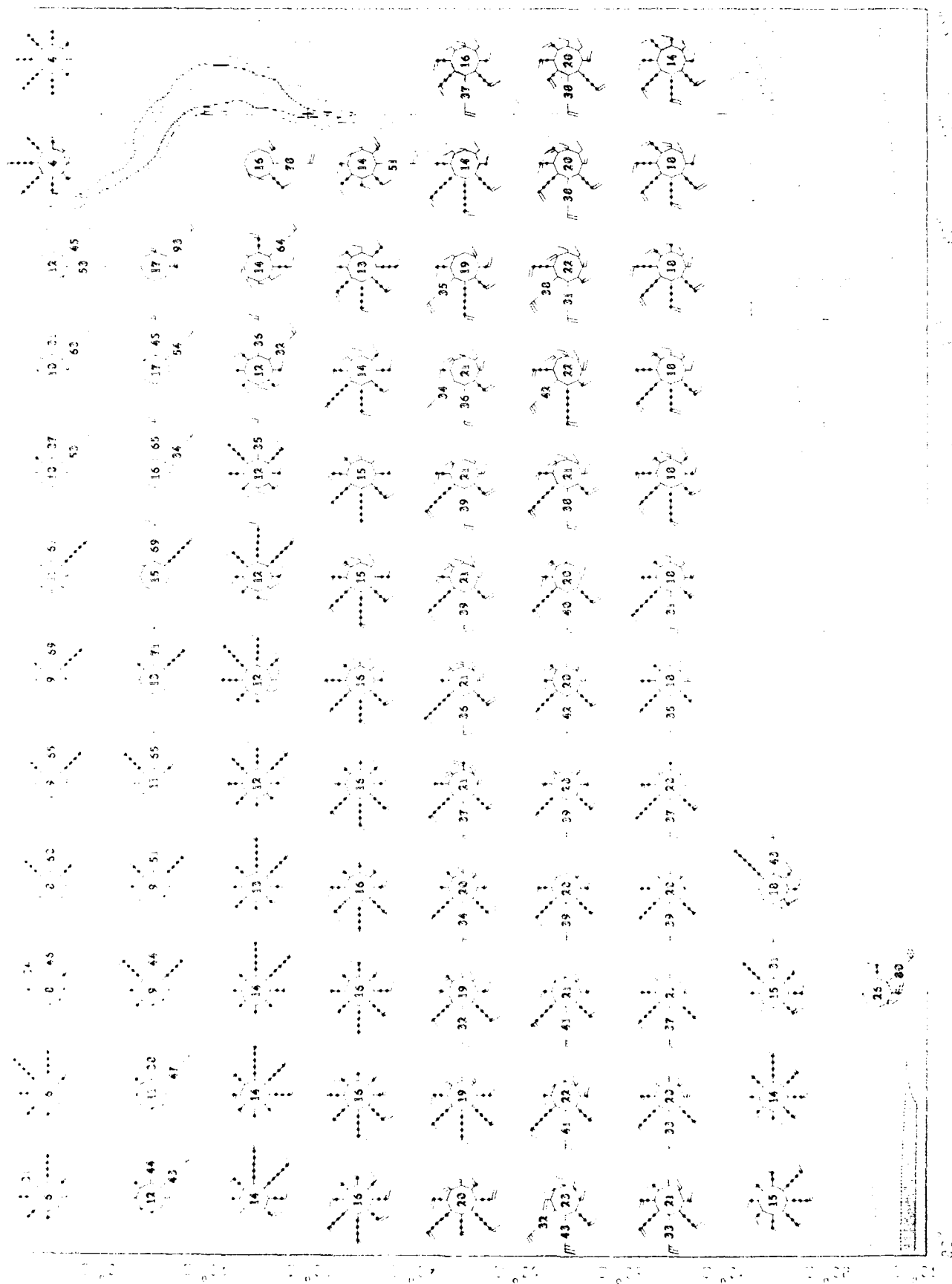








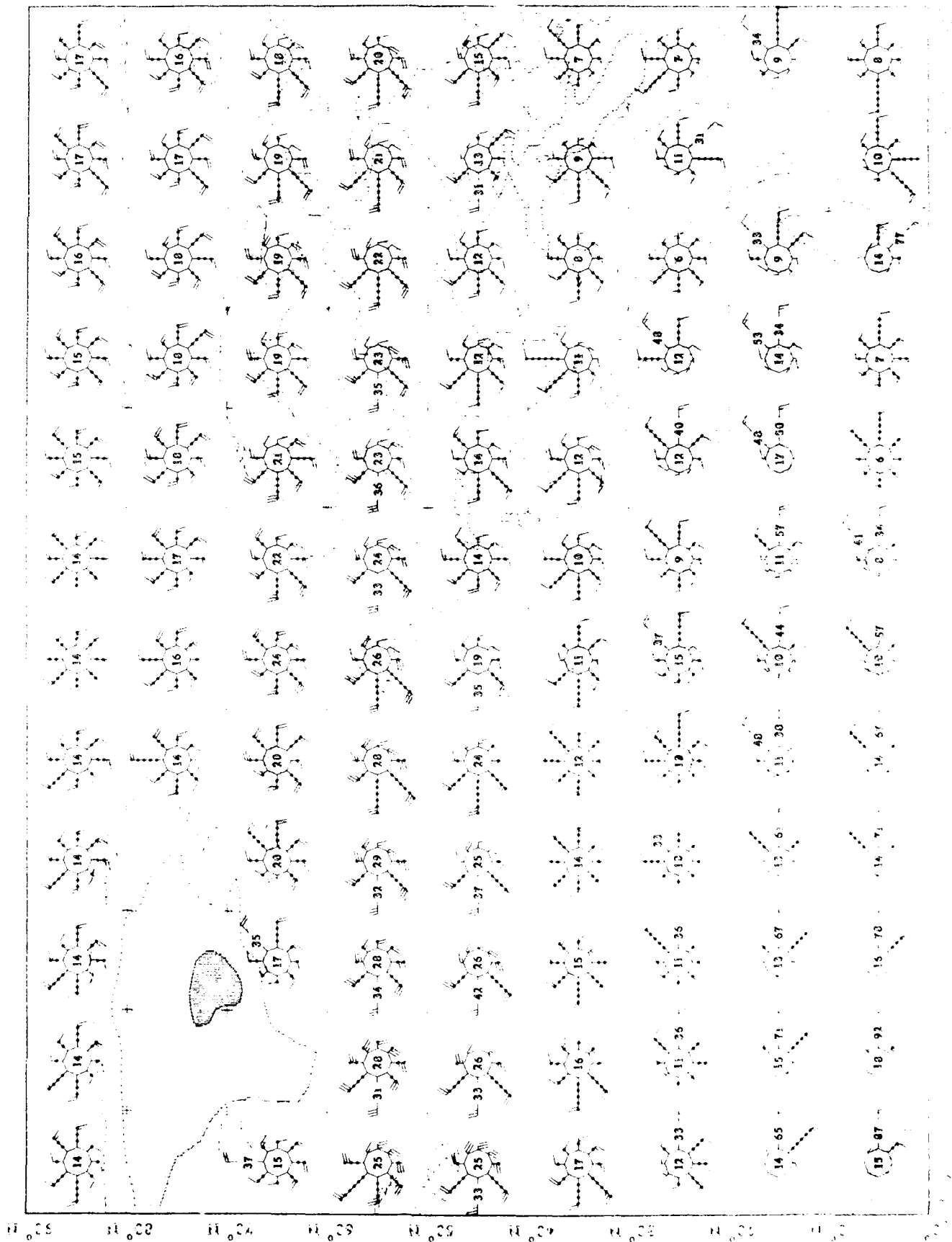


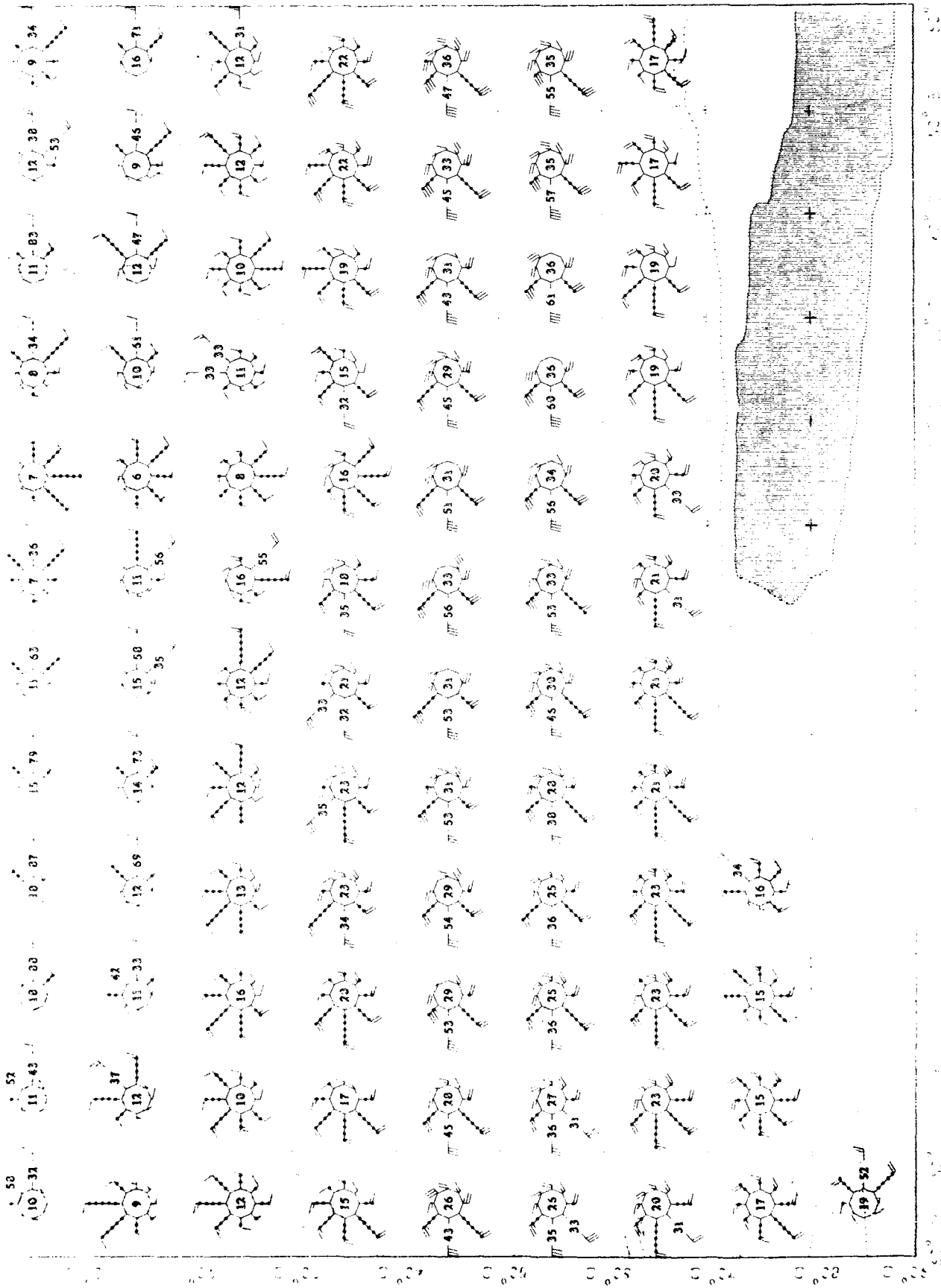


Upper Air Climatology
Southern Hemisphere

1950-1951
1952-1953

1954-1955
1956-1957

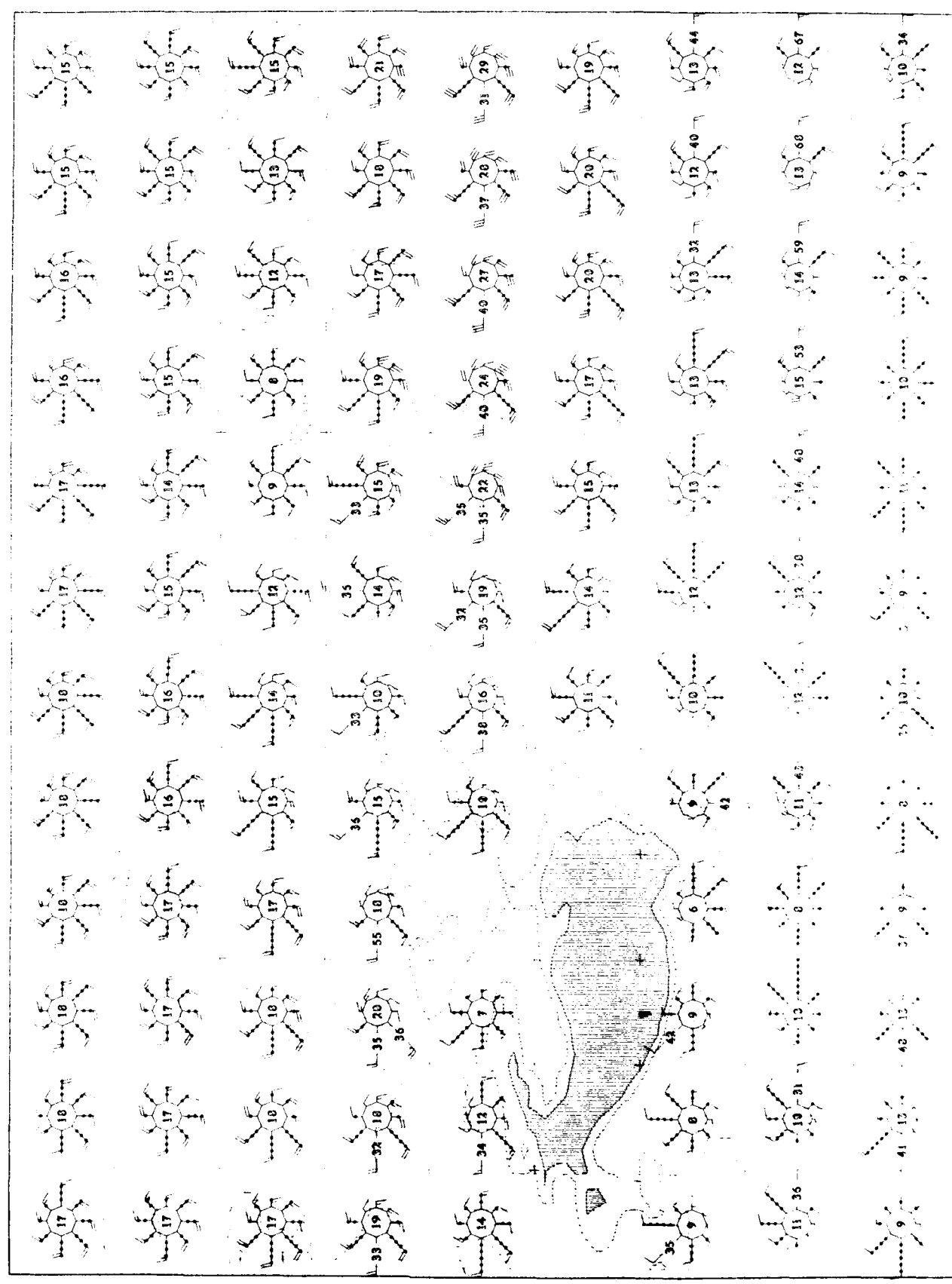


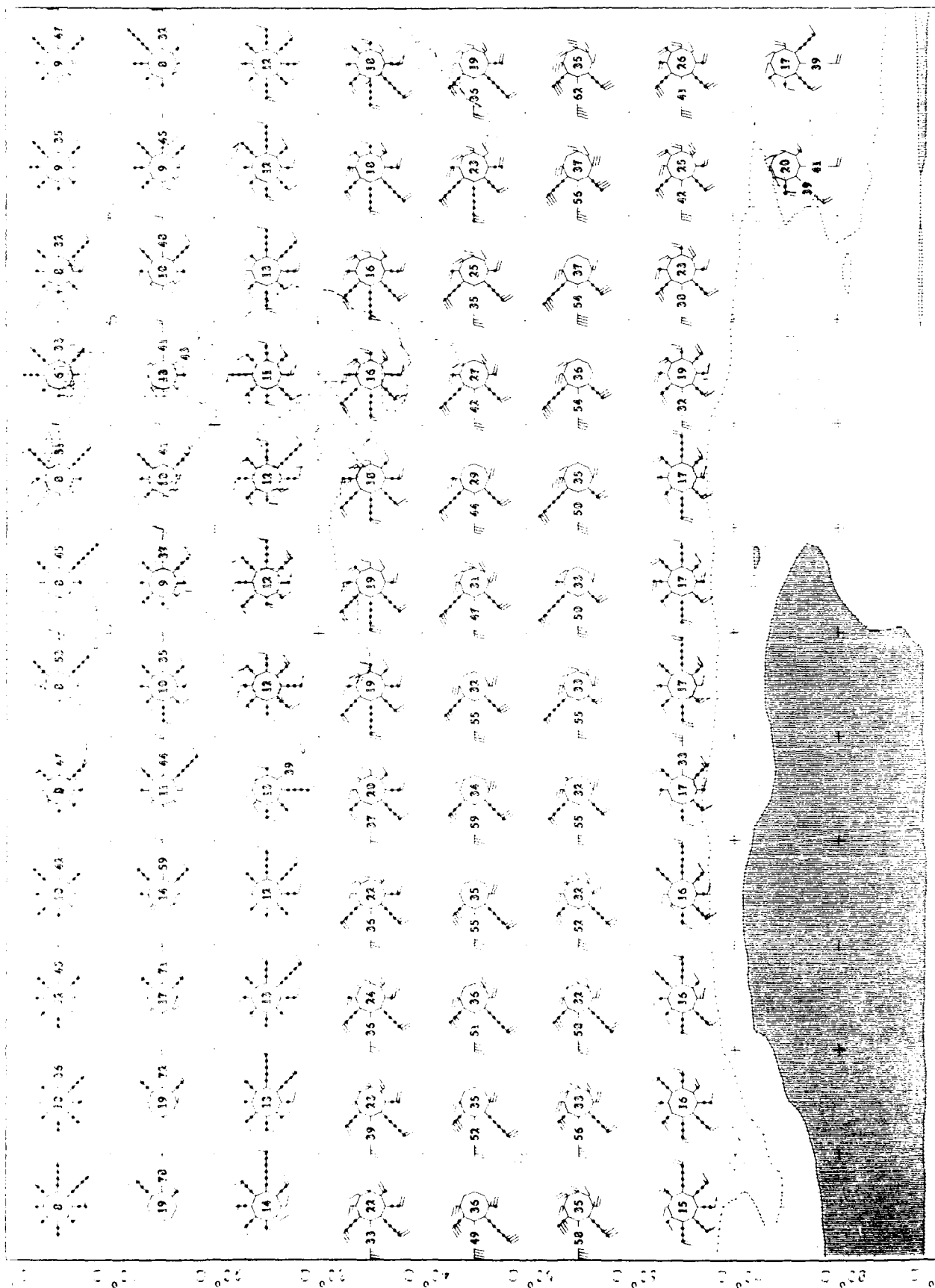


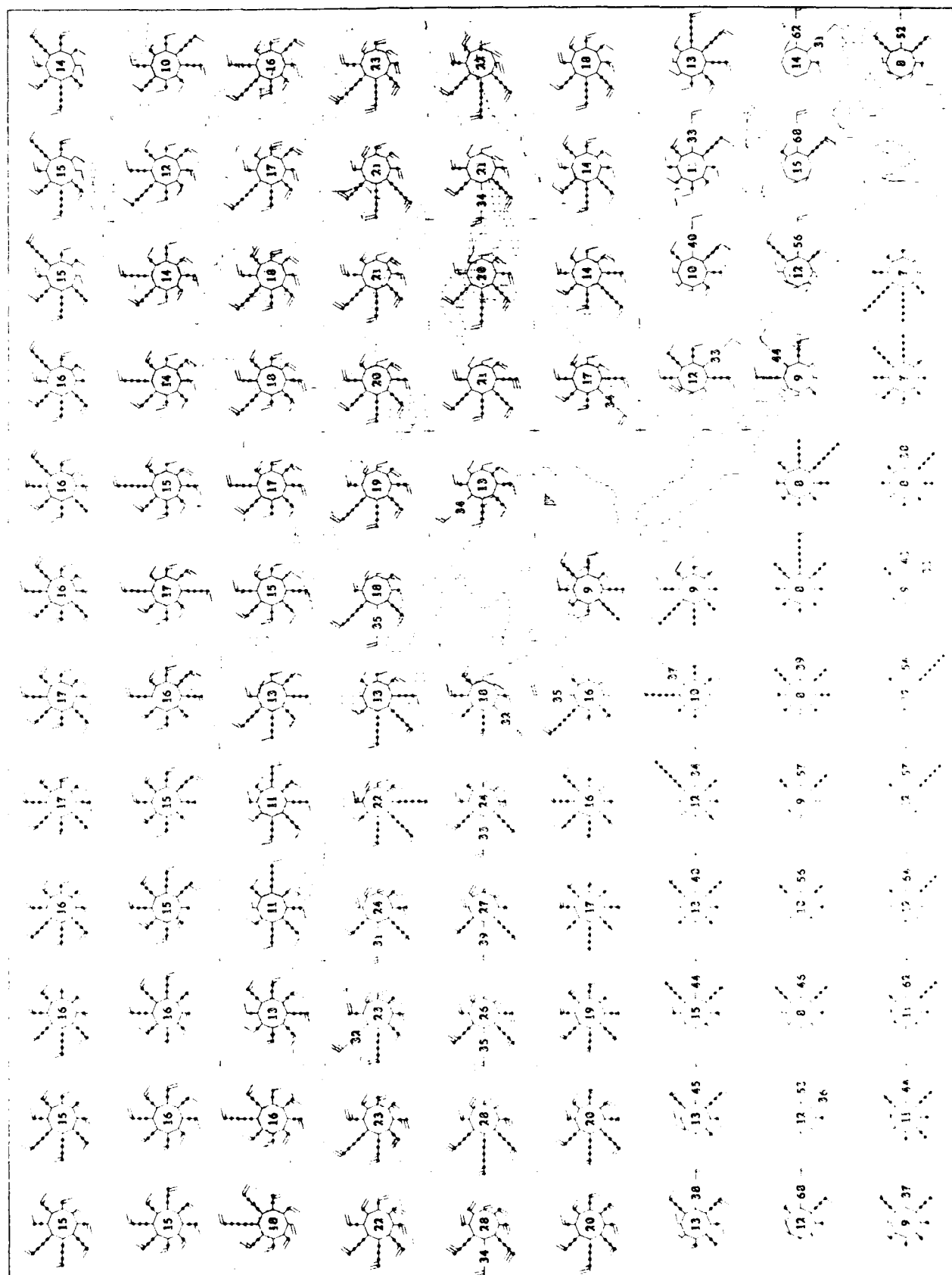
2000-2001
Northern Hemisphere

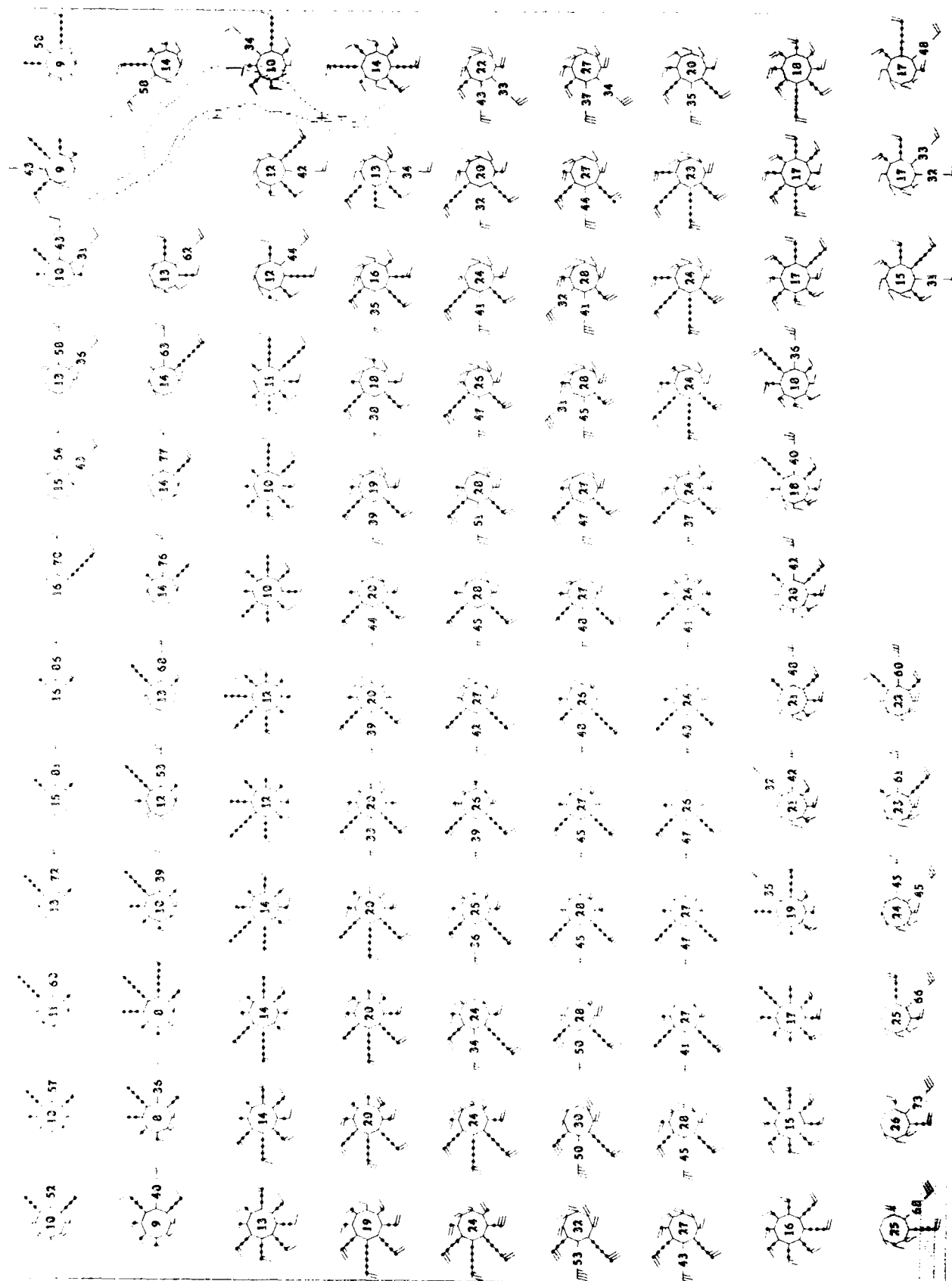
2000-2001
Northern Hemisphere

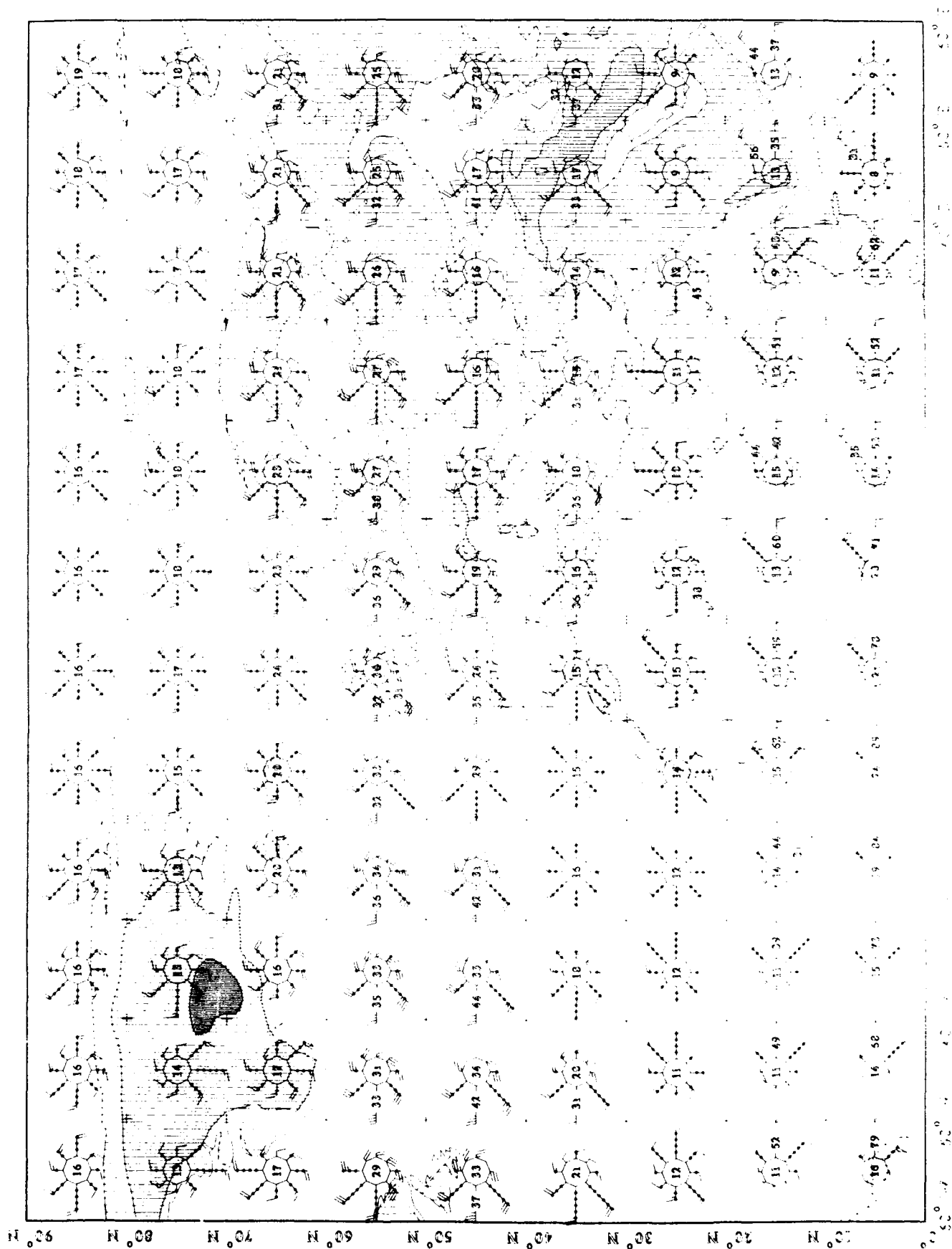
2000-2001
Northern Hemisphere

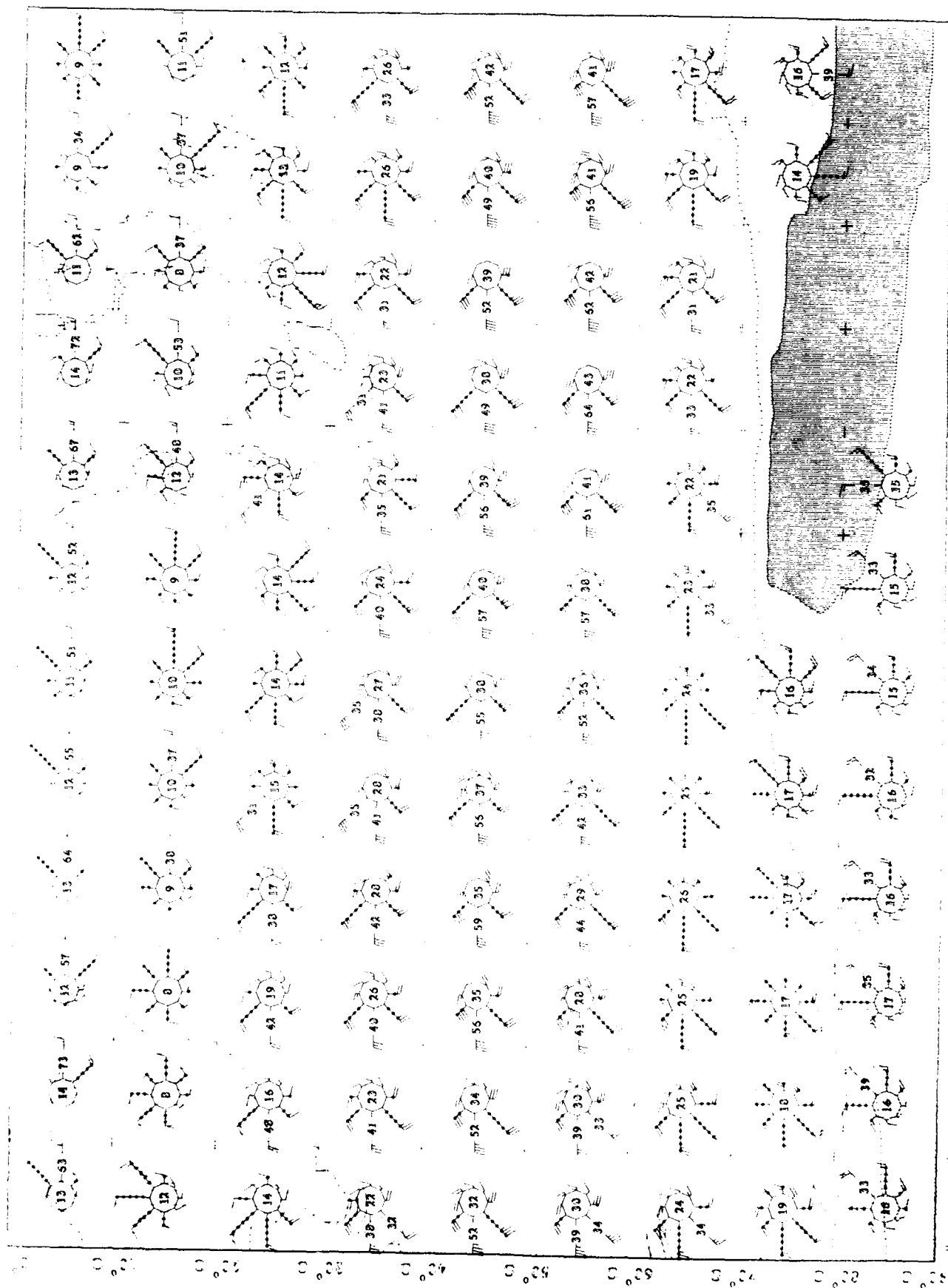




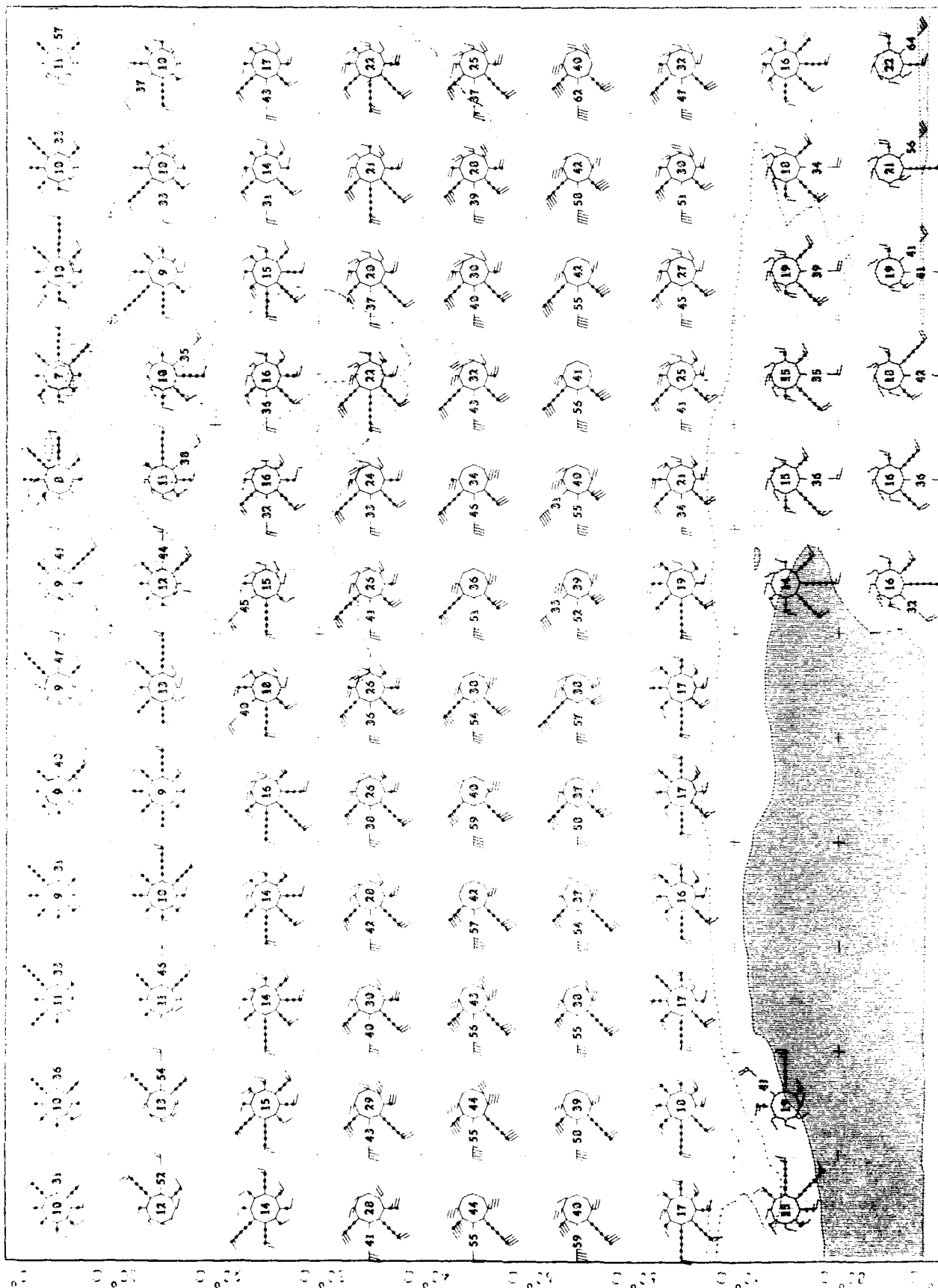






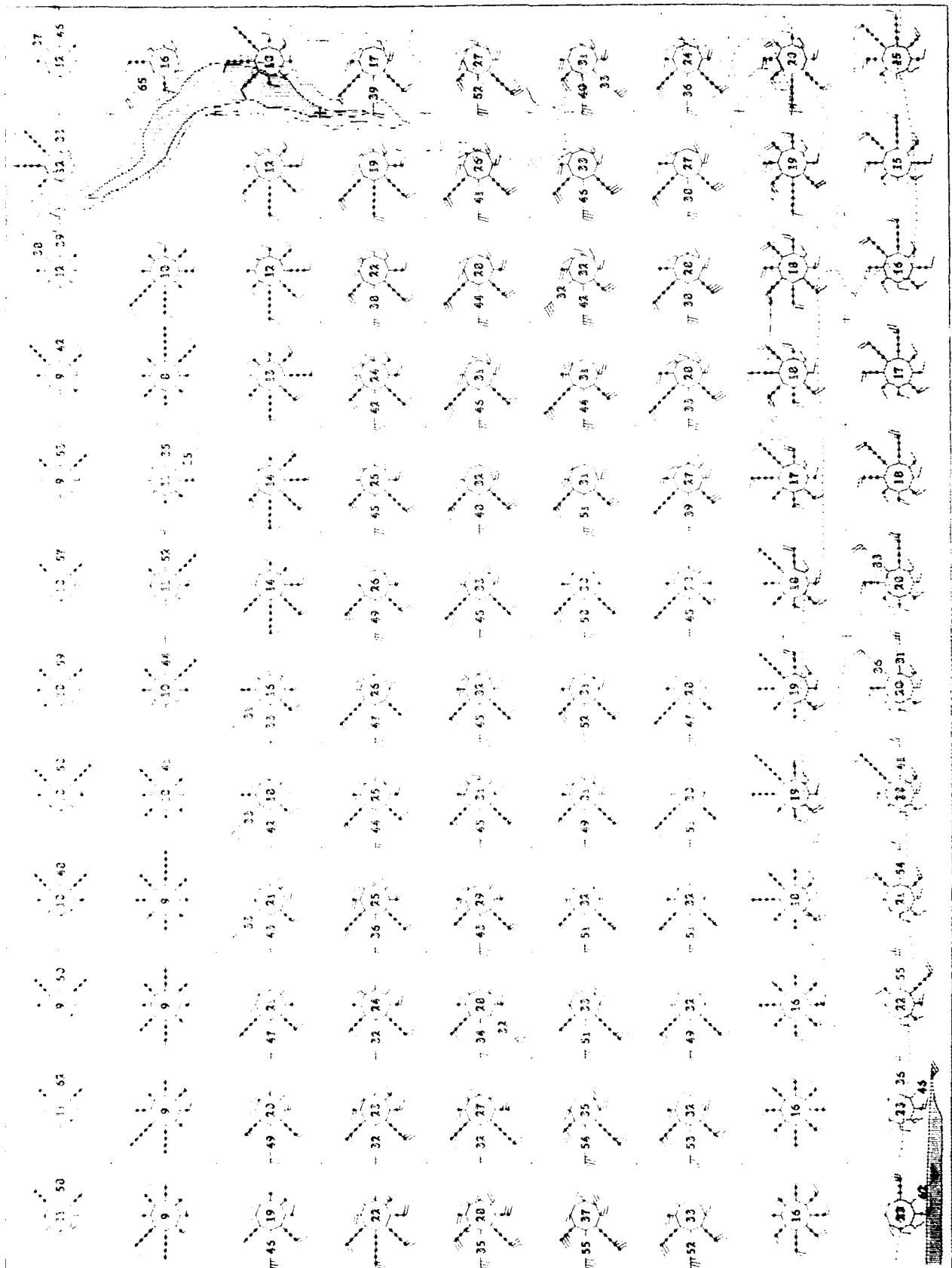


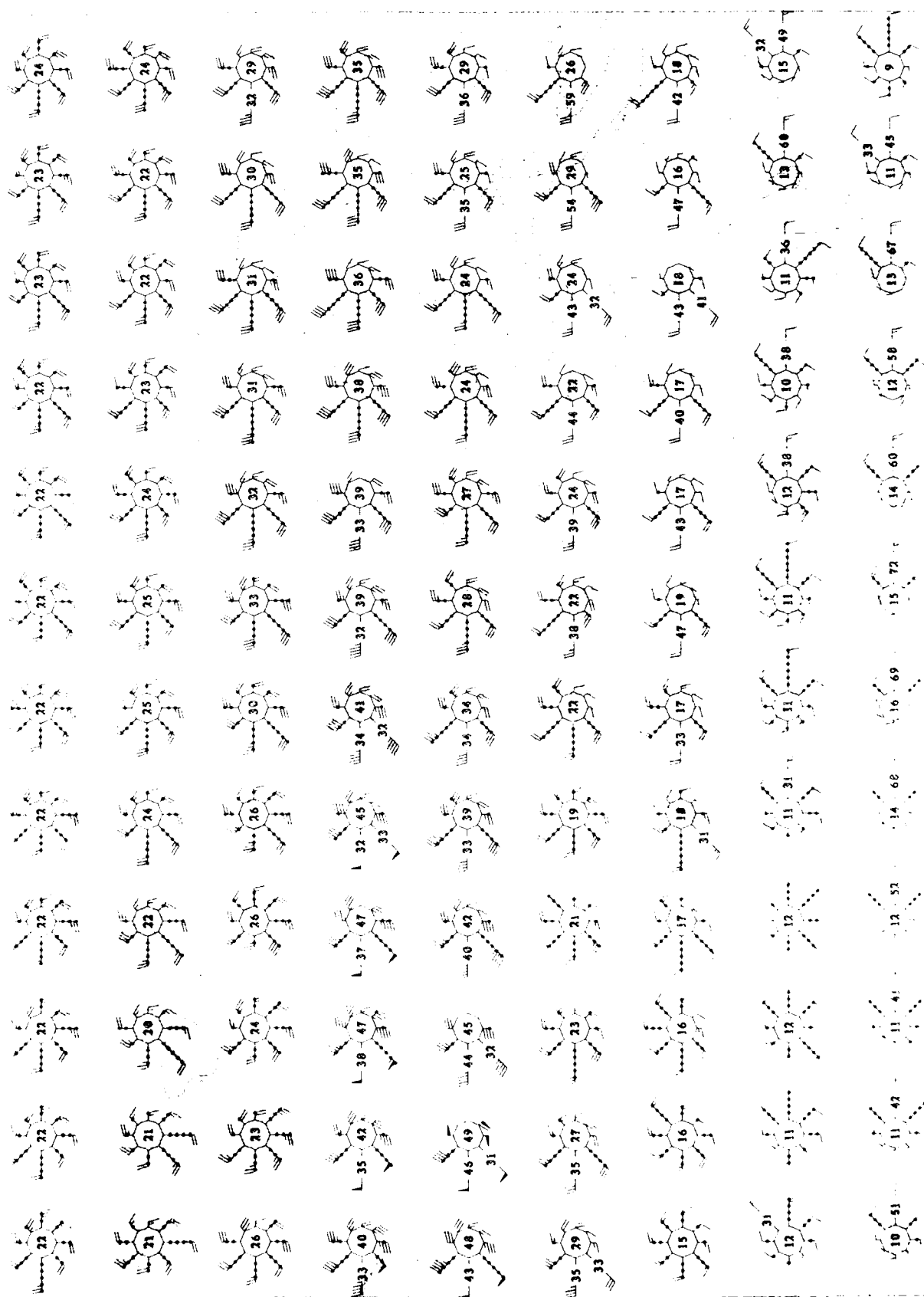


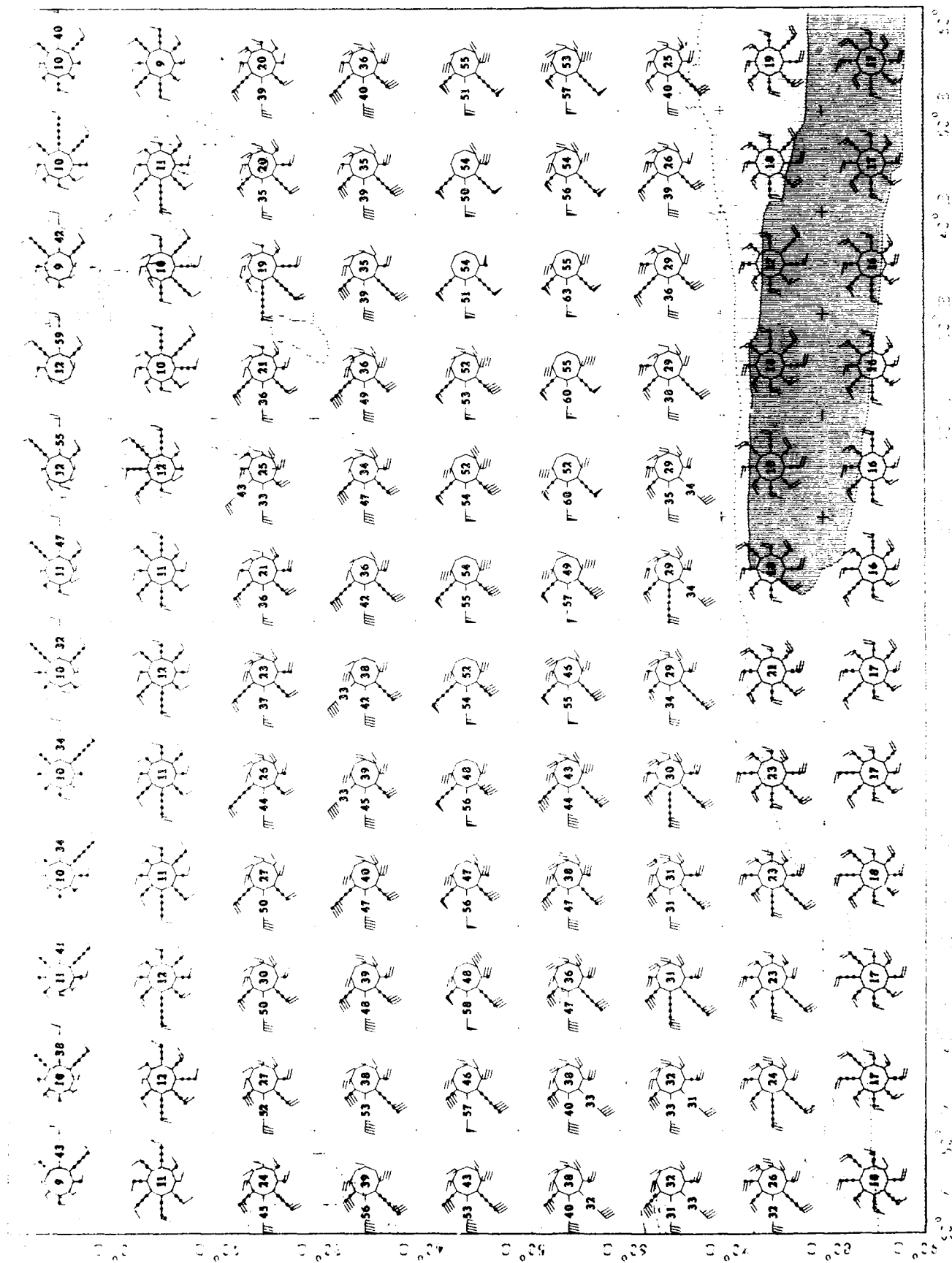


Upper Arm Glaciation
 Crossed Horizontal

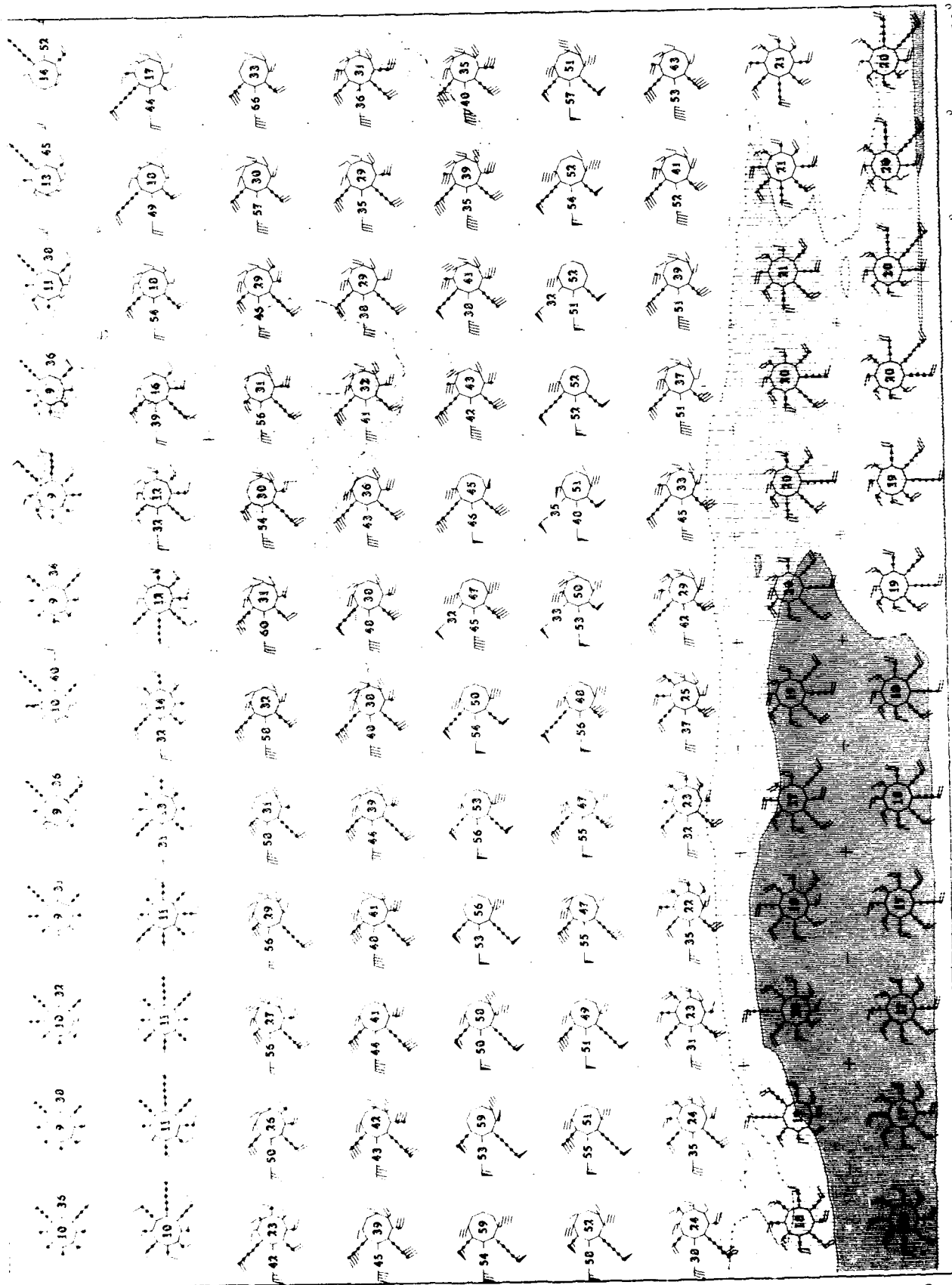
000000
 000000











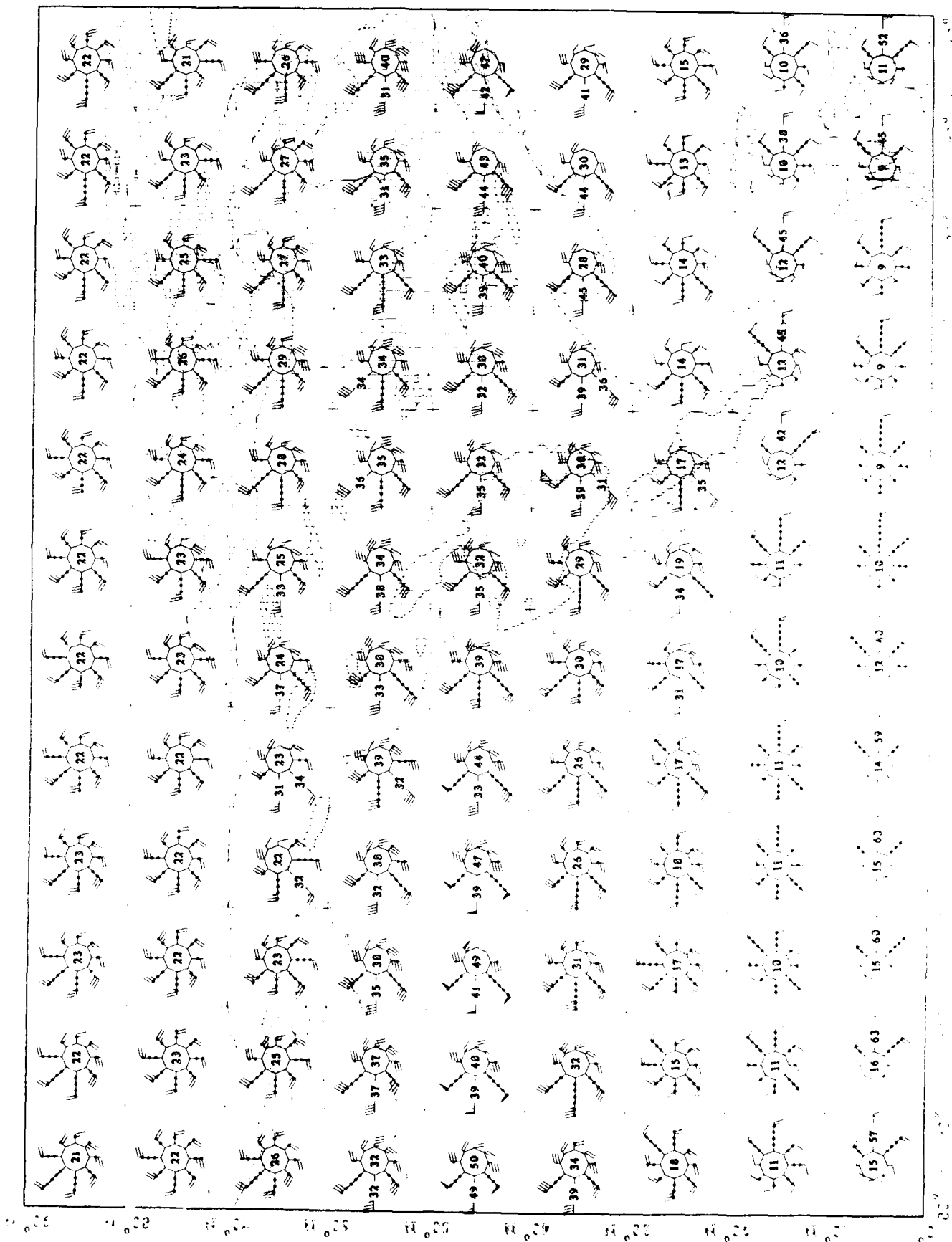
Upper Air Climatology
Southern Hemisphere

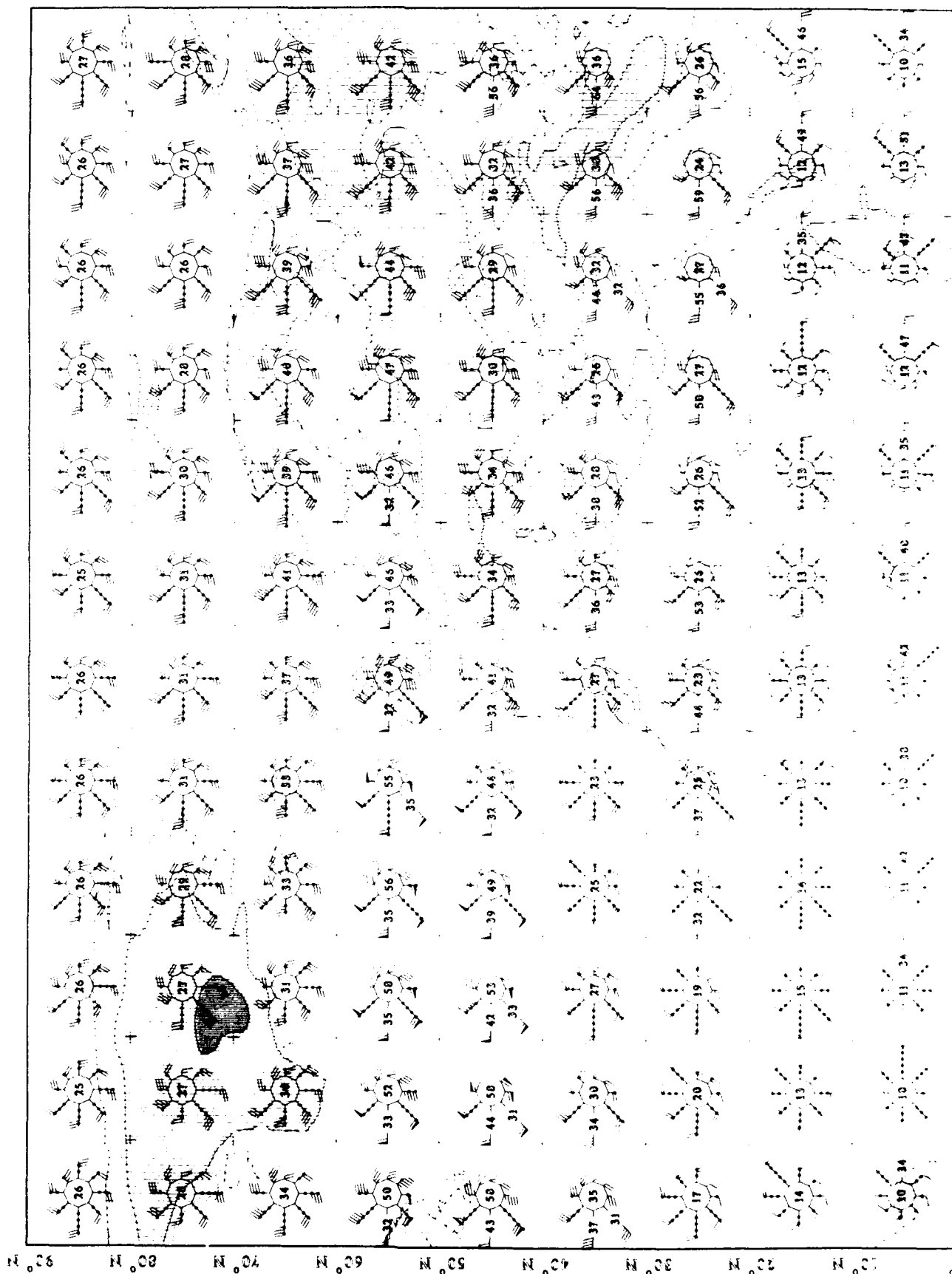
October 1960
500 MB

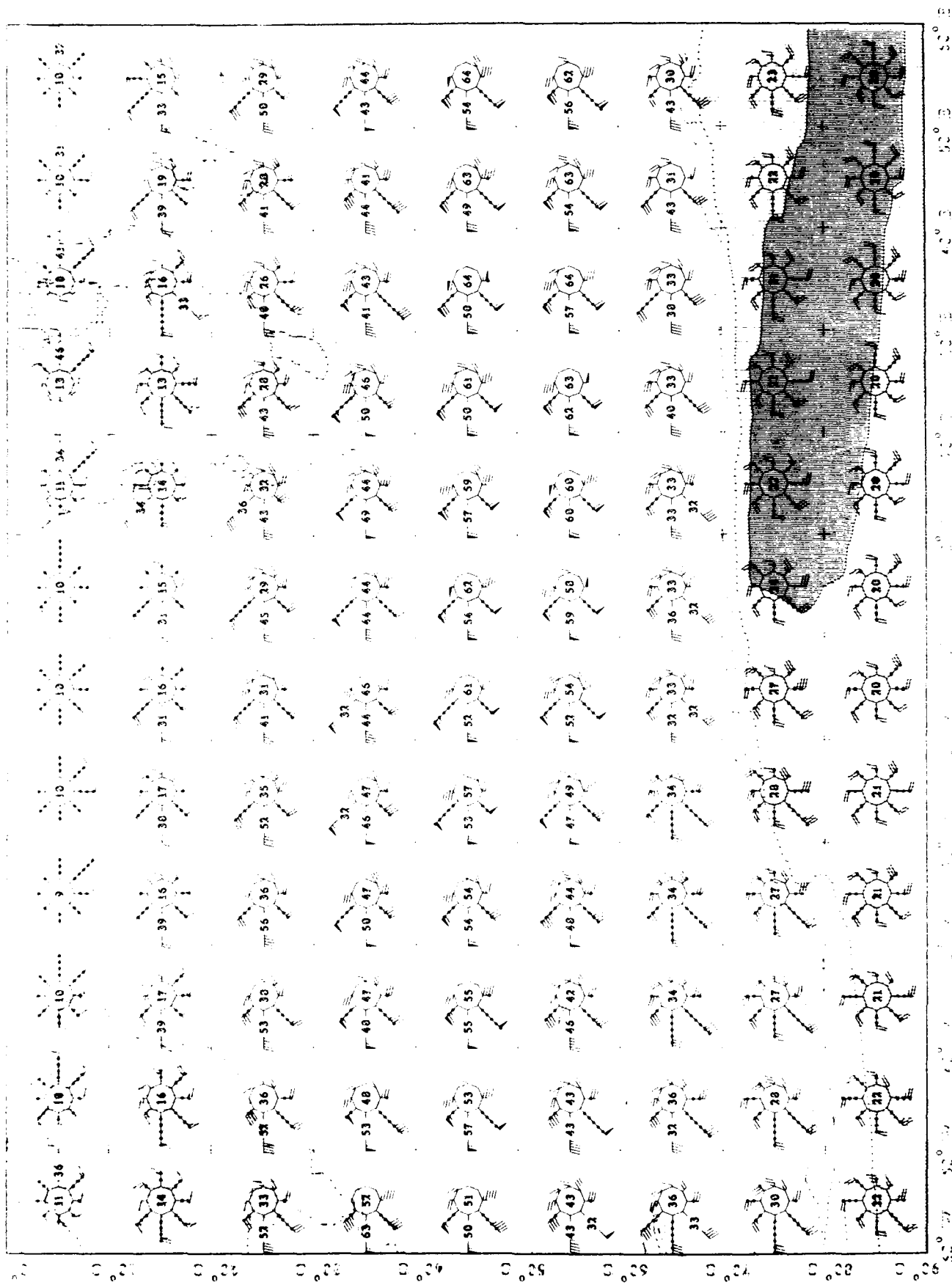
Upper Air Climatology Northern Hemisphere

2000 feet
Wind Roses

500 MB



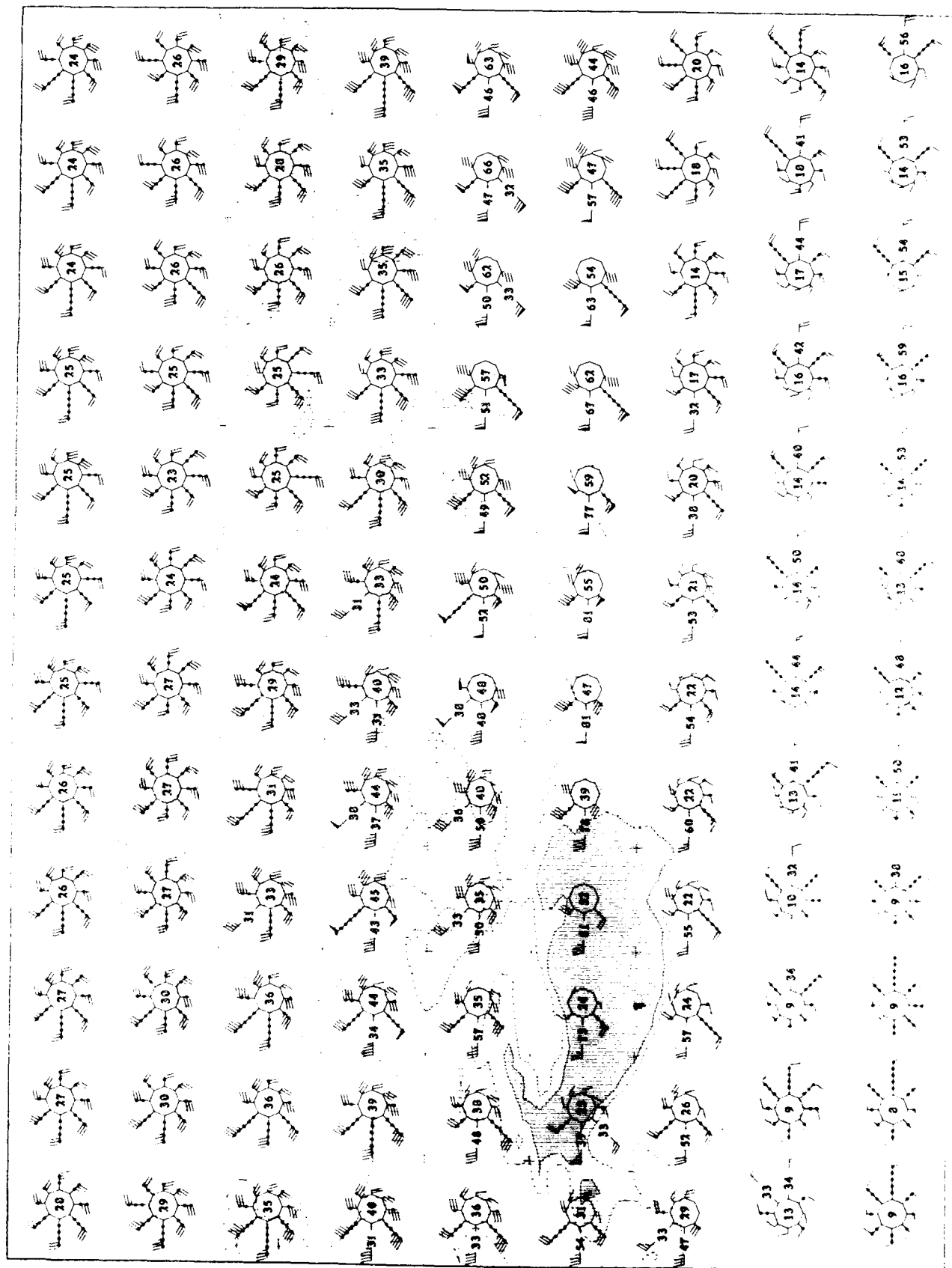


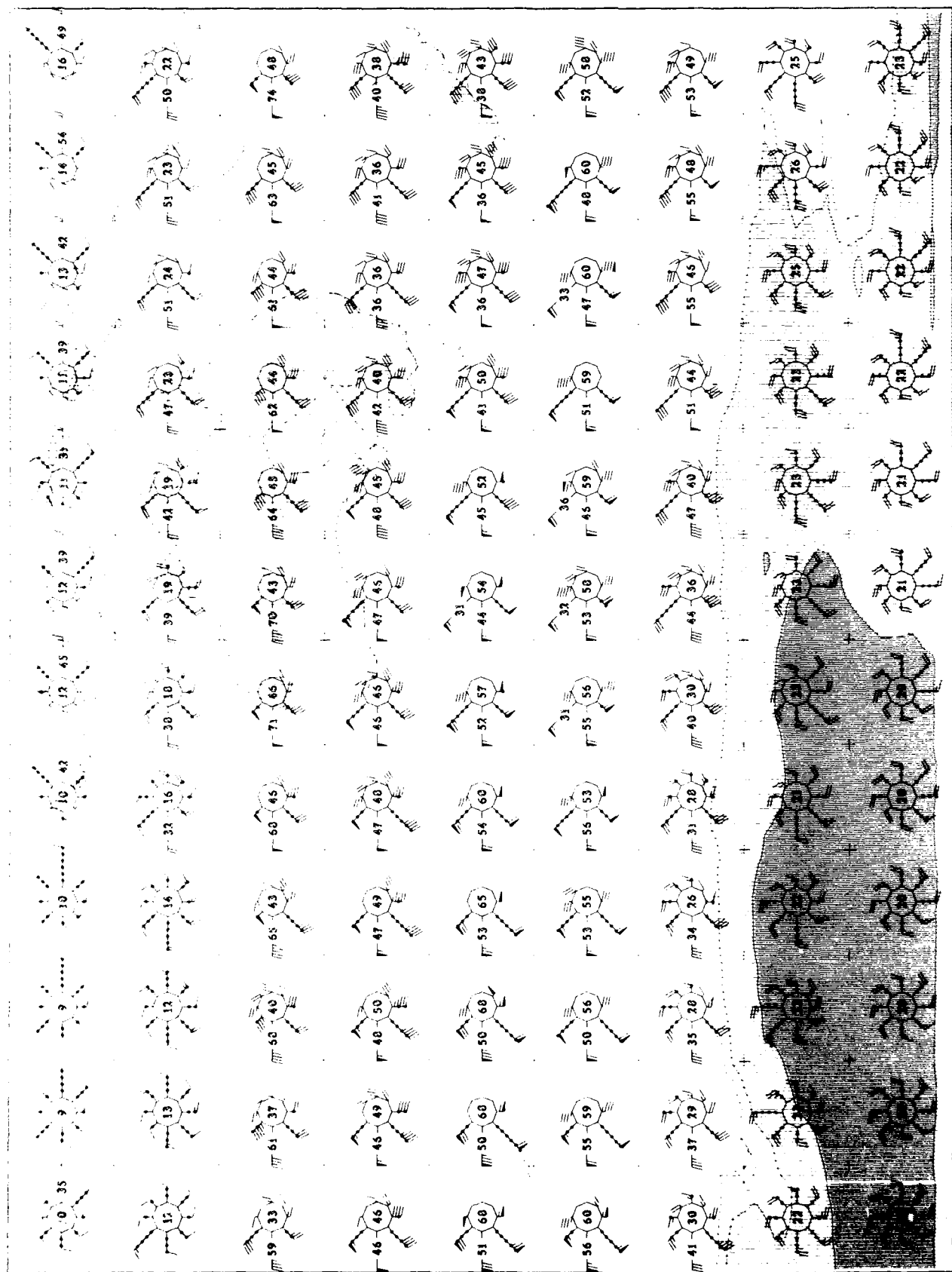


Upper Air Climatology
Northern Hemisphere

1200-1300
Wind Roses

600 MB

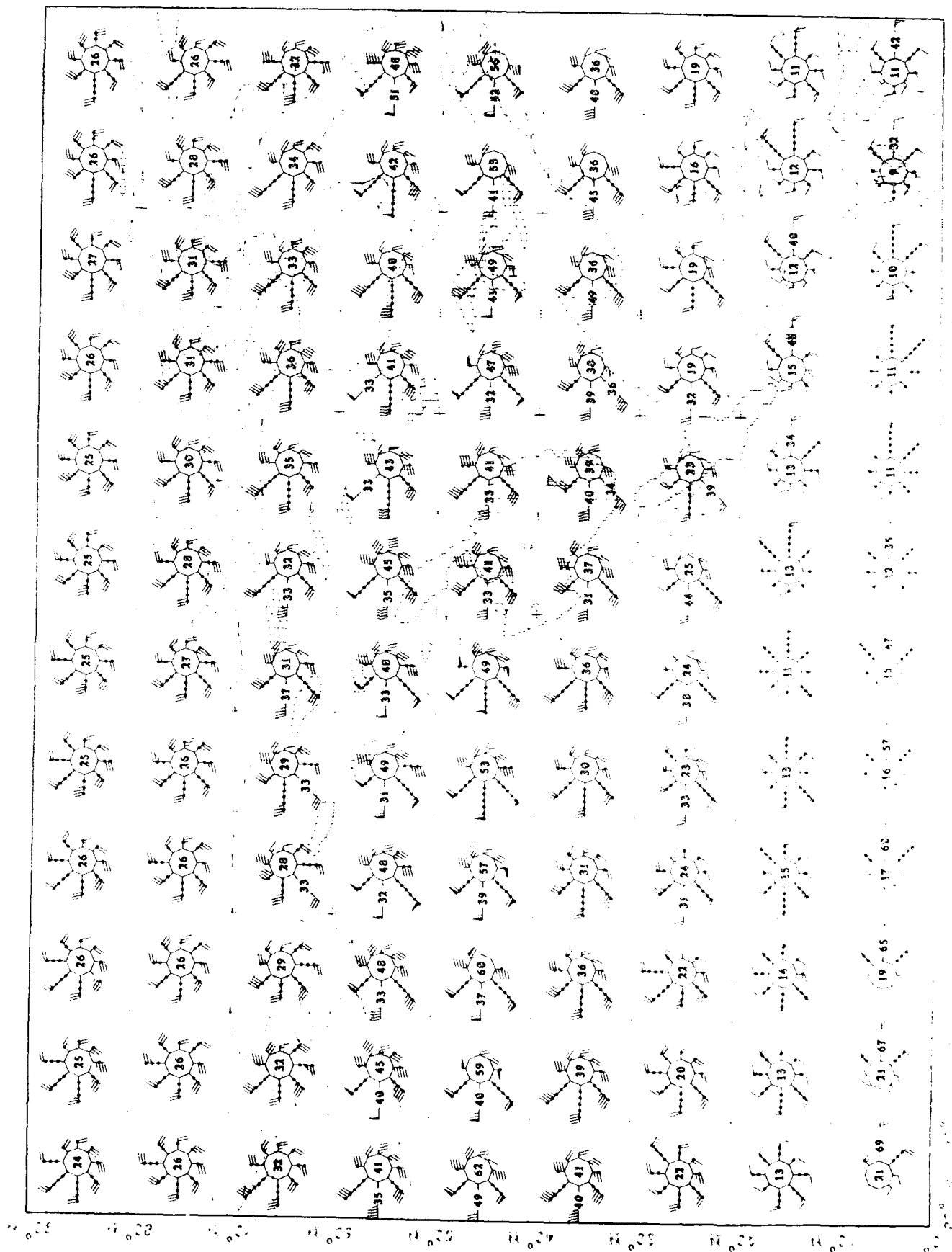


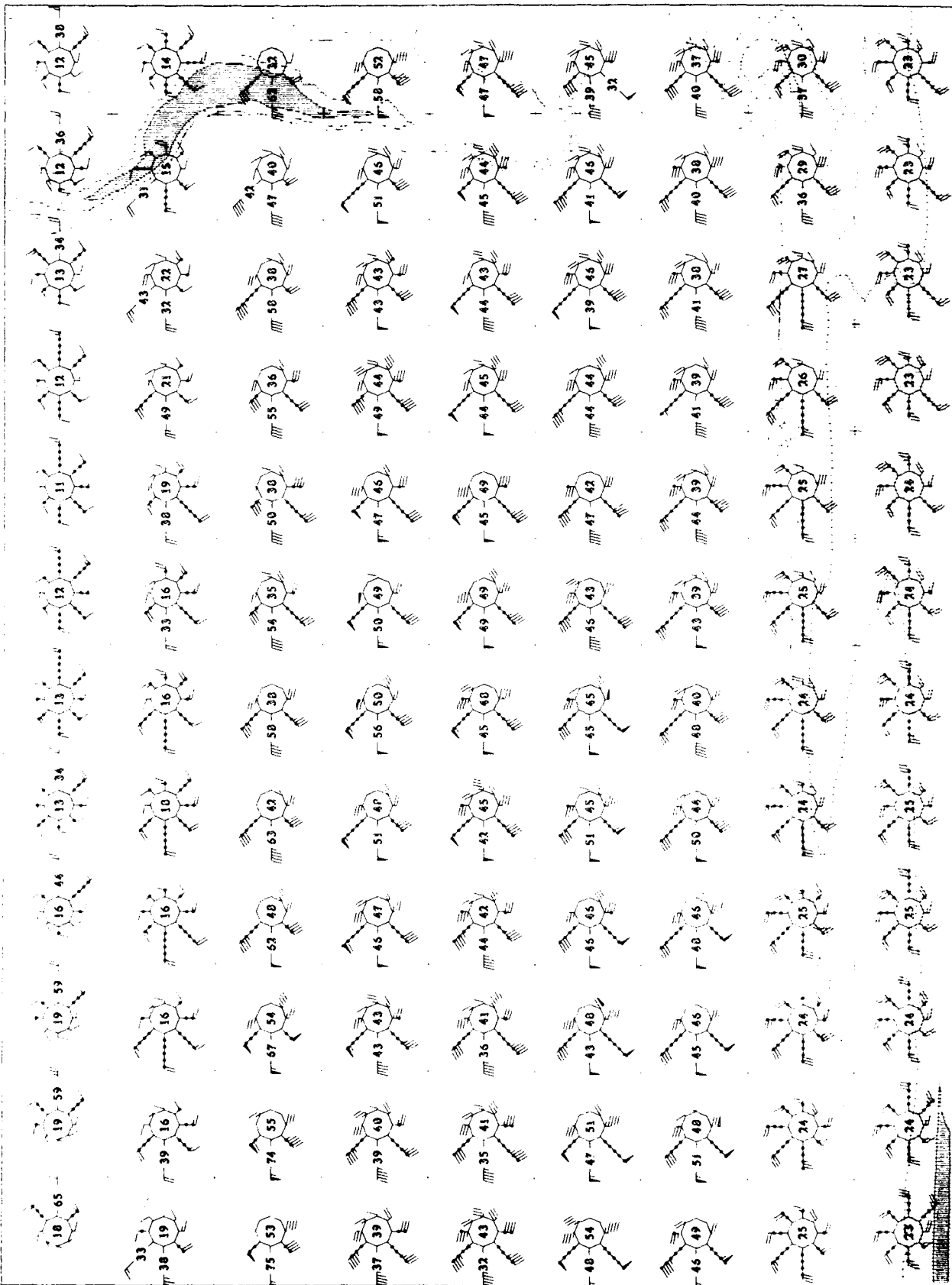


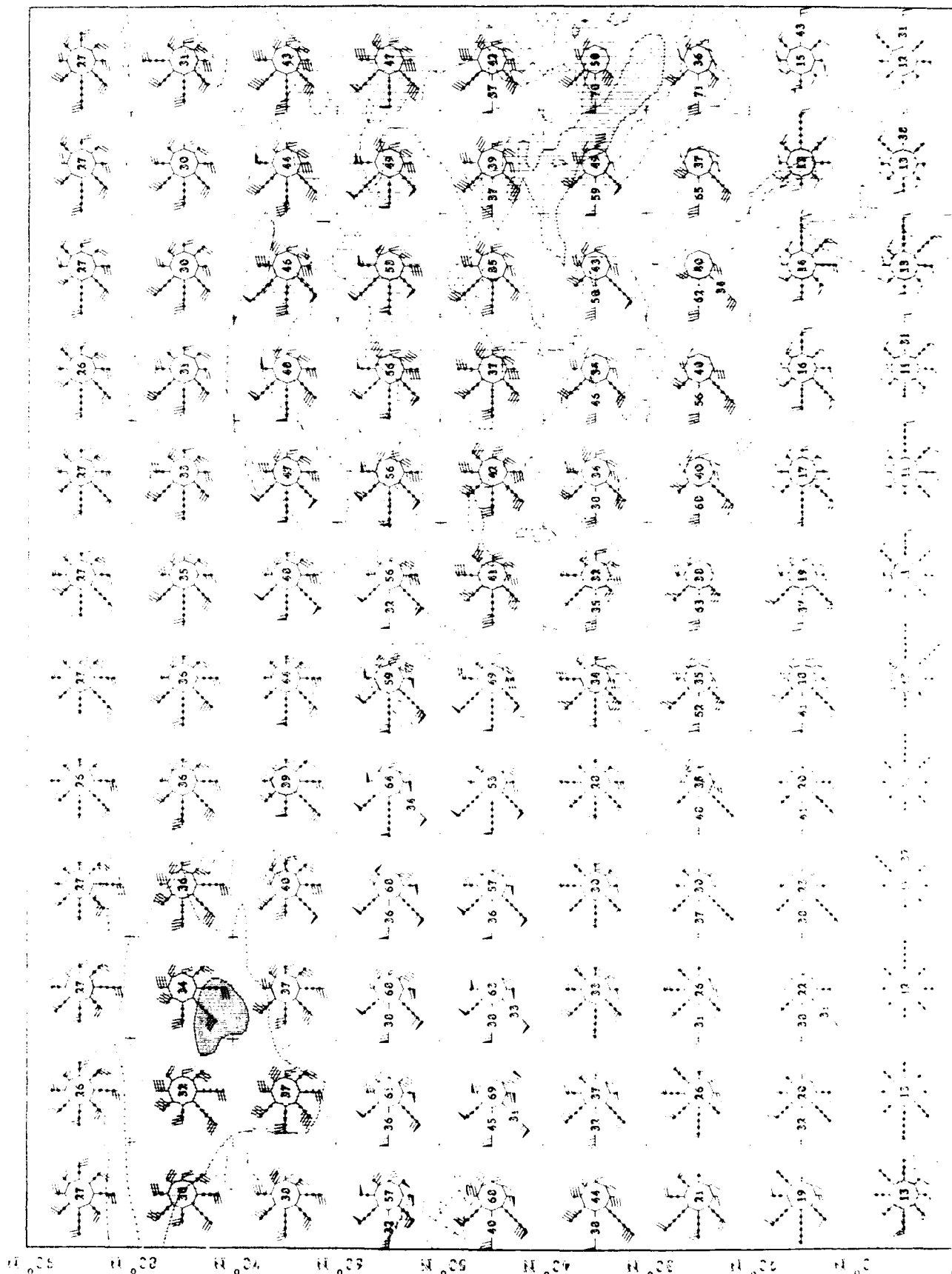
60-12-21
401 NWS

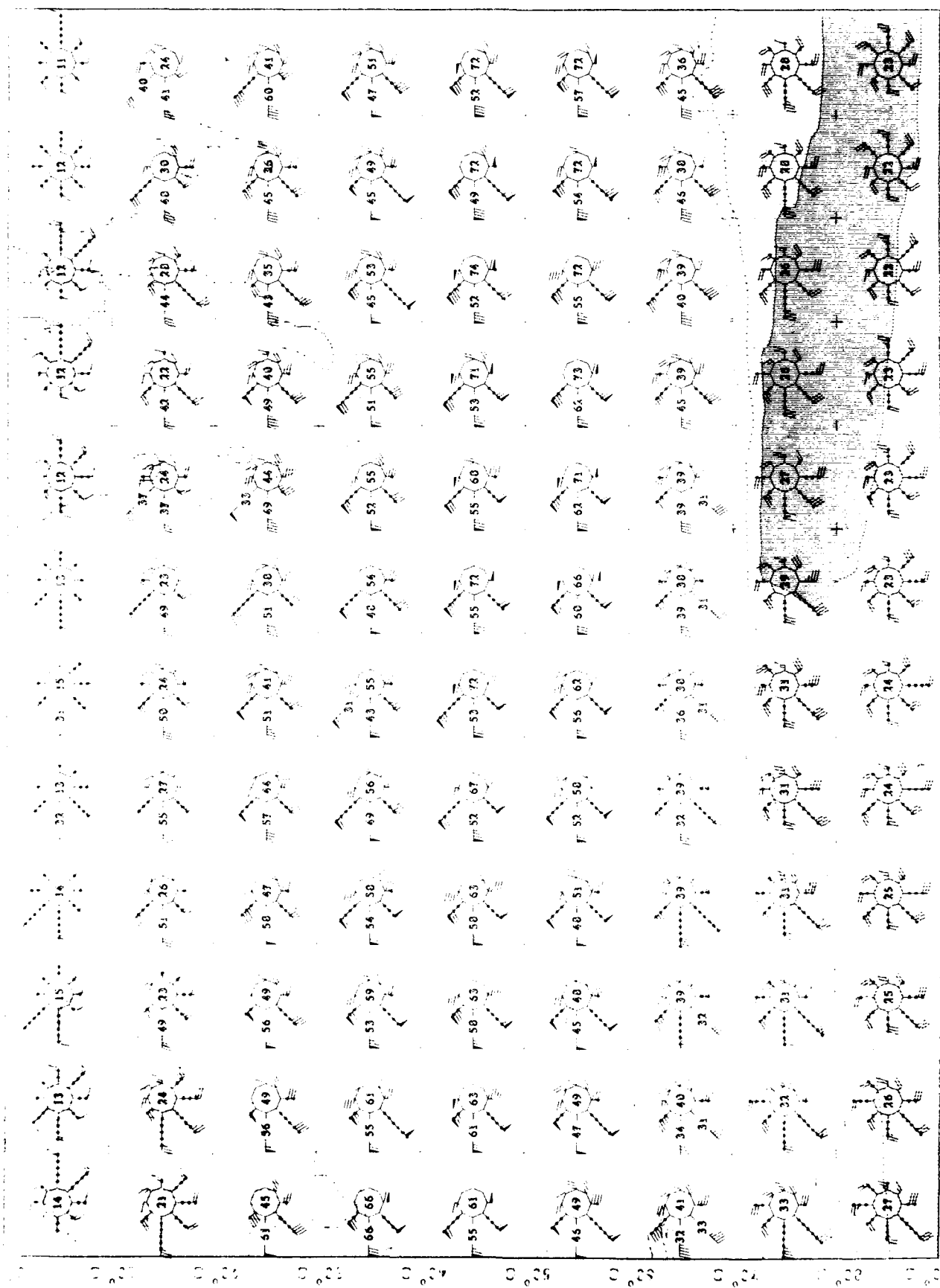
60-12-21
401 NWS

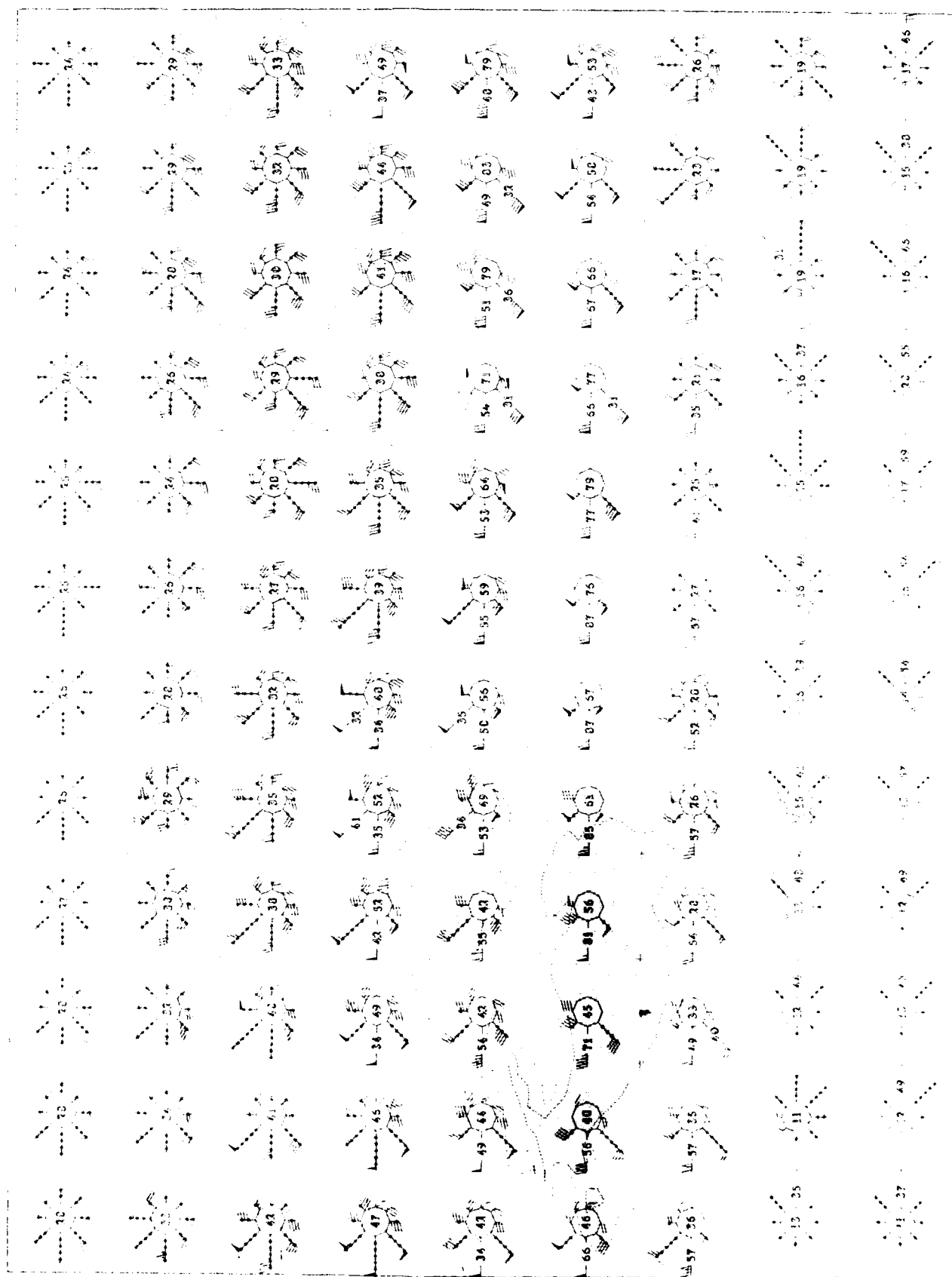
Open Air Meteorology
Northern Hemisphere

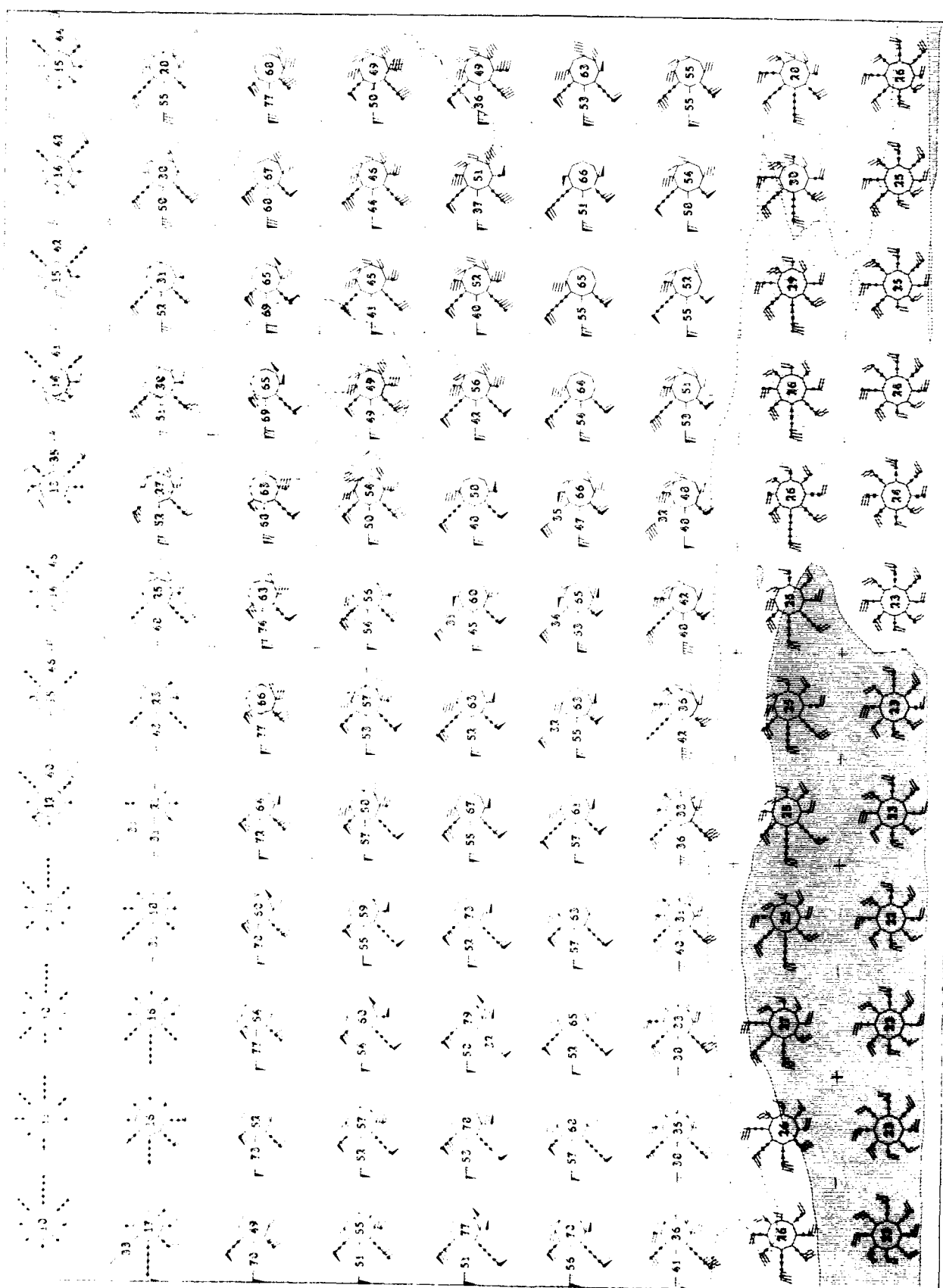




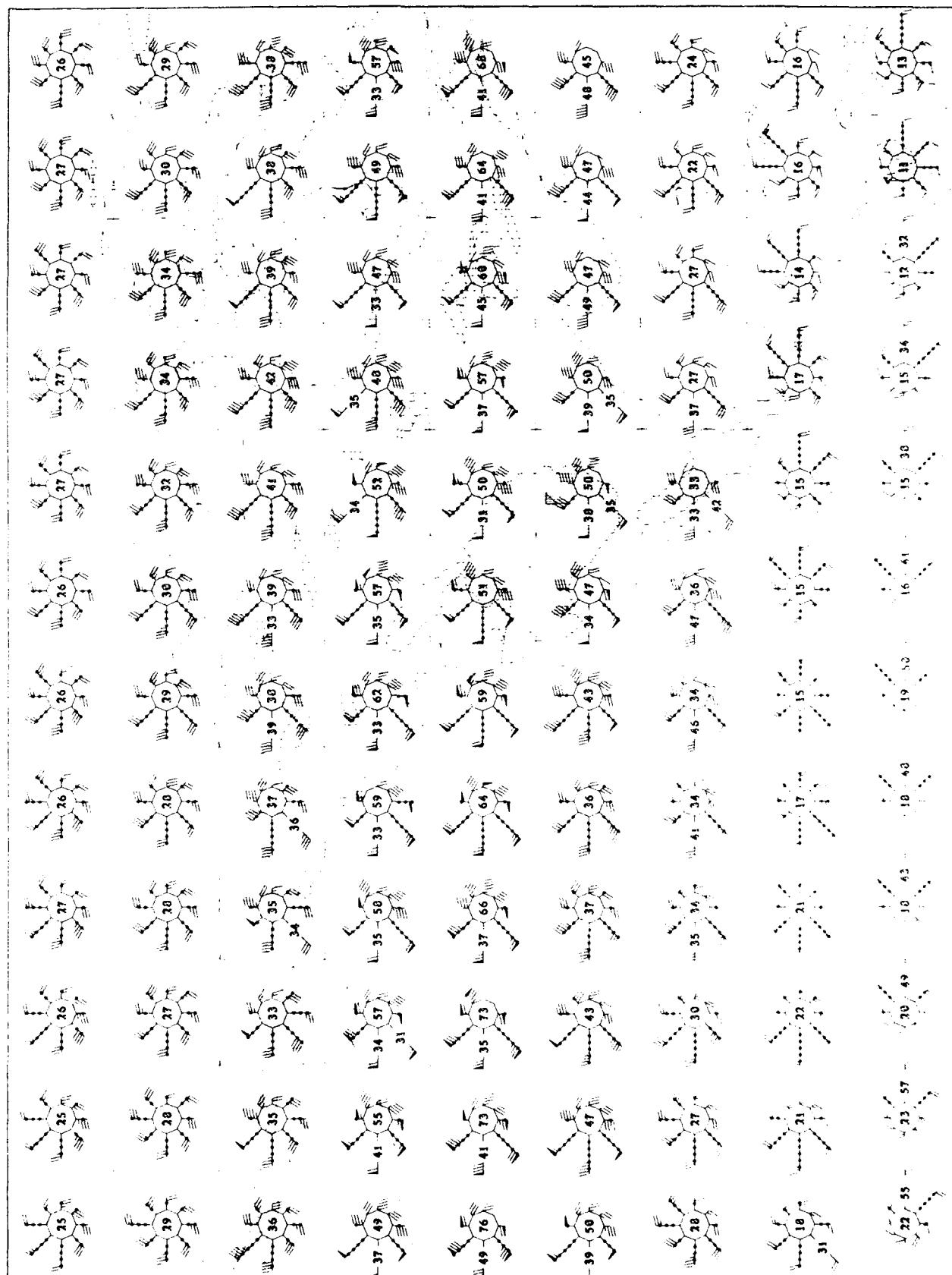


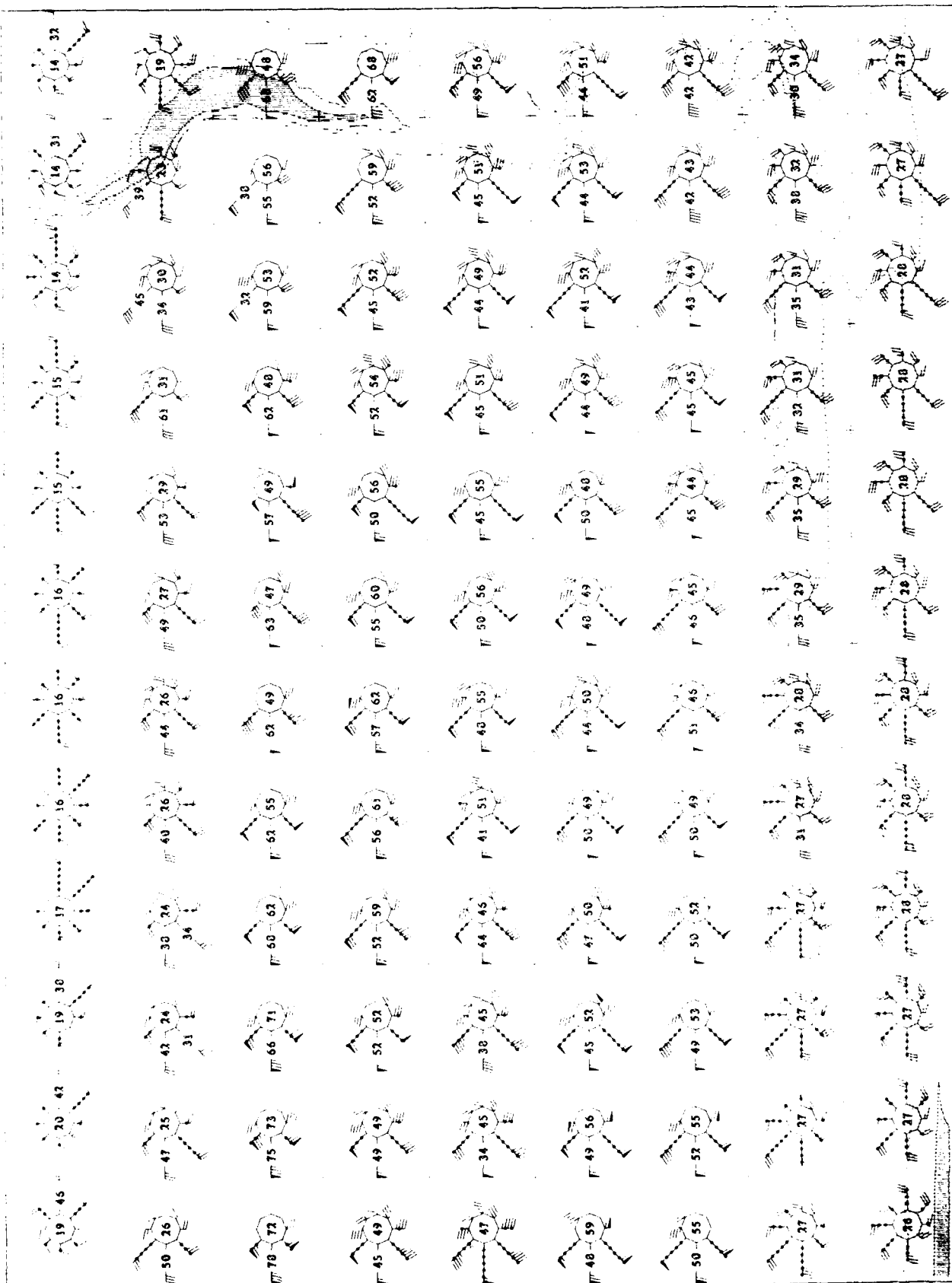






Upper Air Climatology
Southern Hemisphere

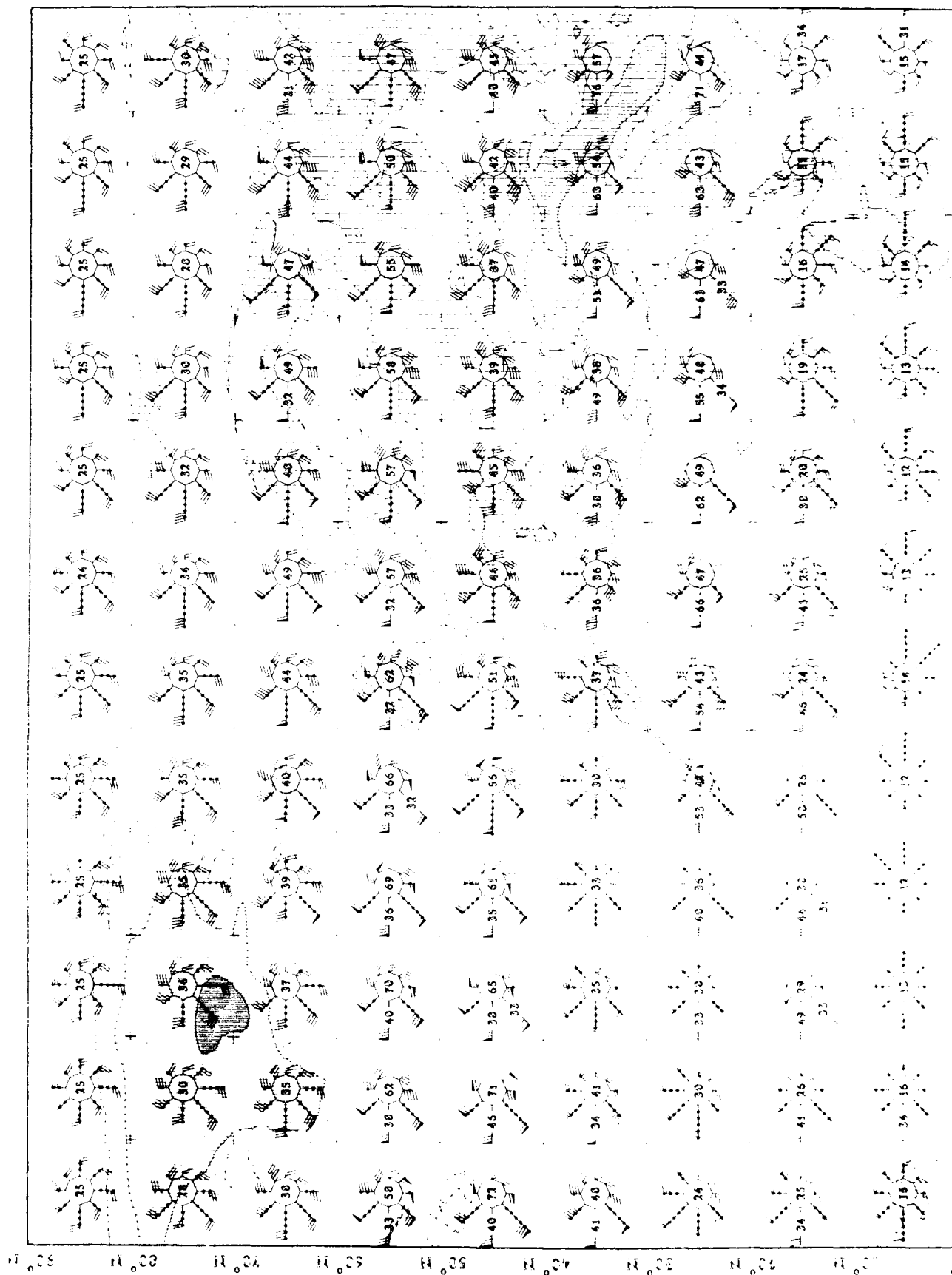


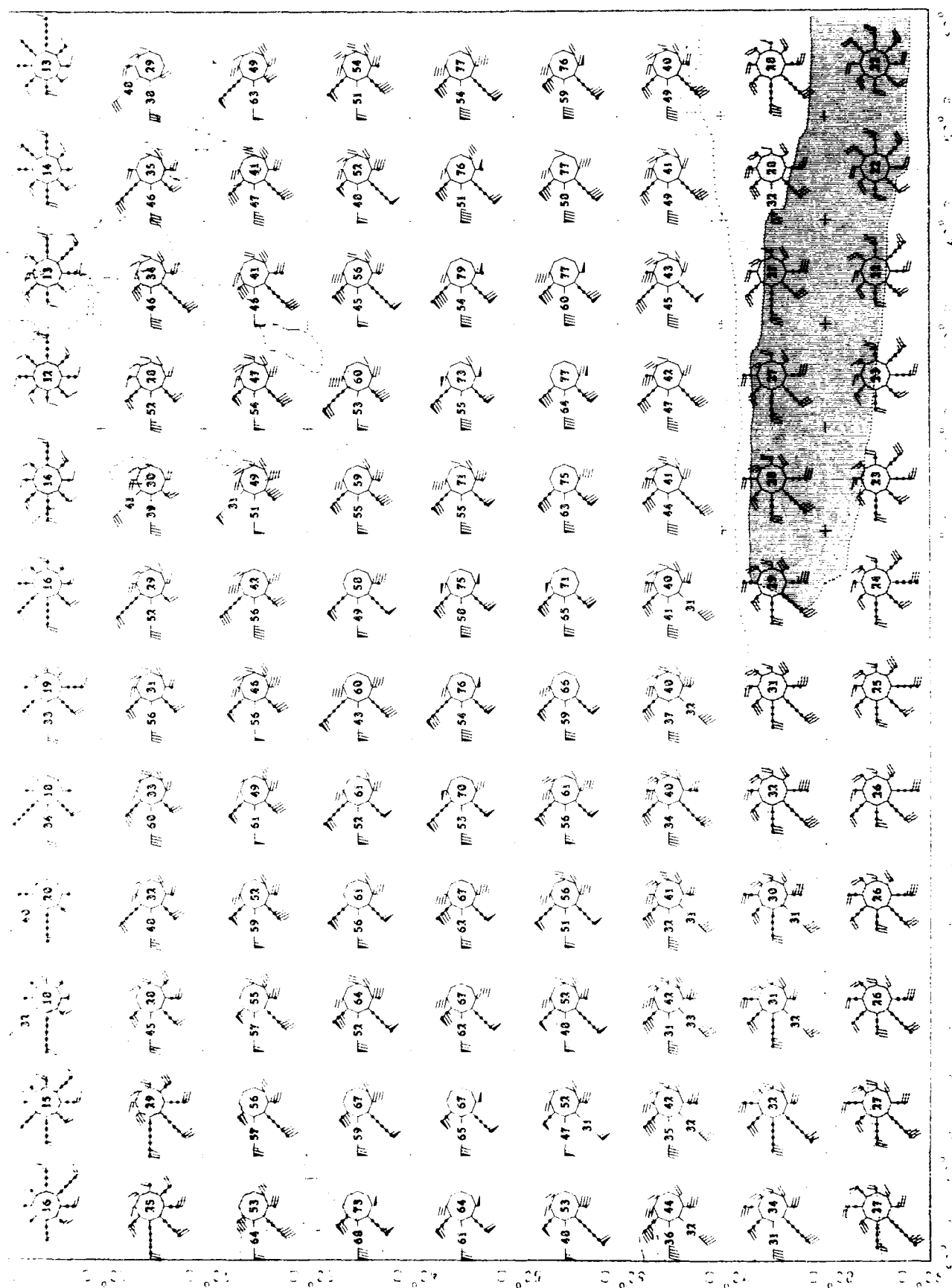


Upper Air Climatology
Northern Hemisphere

Figure 10-5-10
Wind Roses

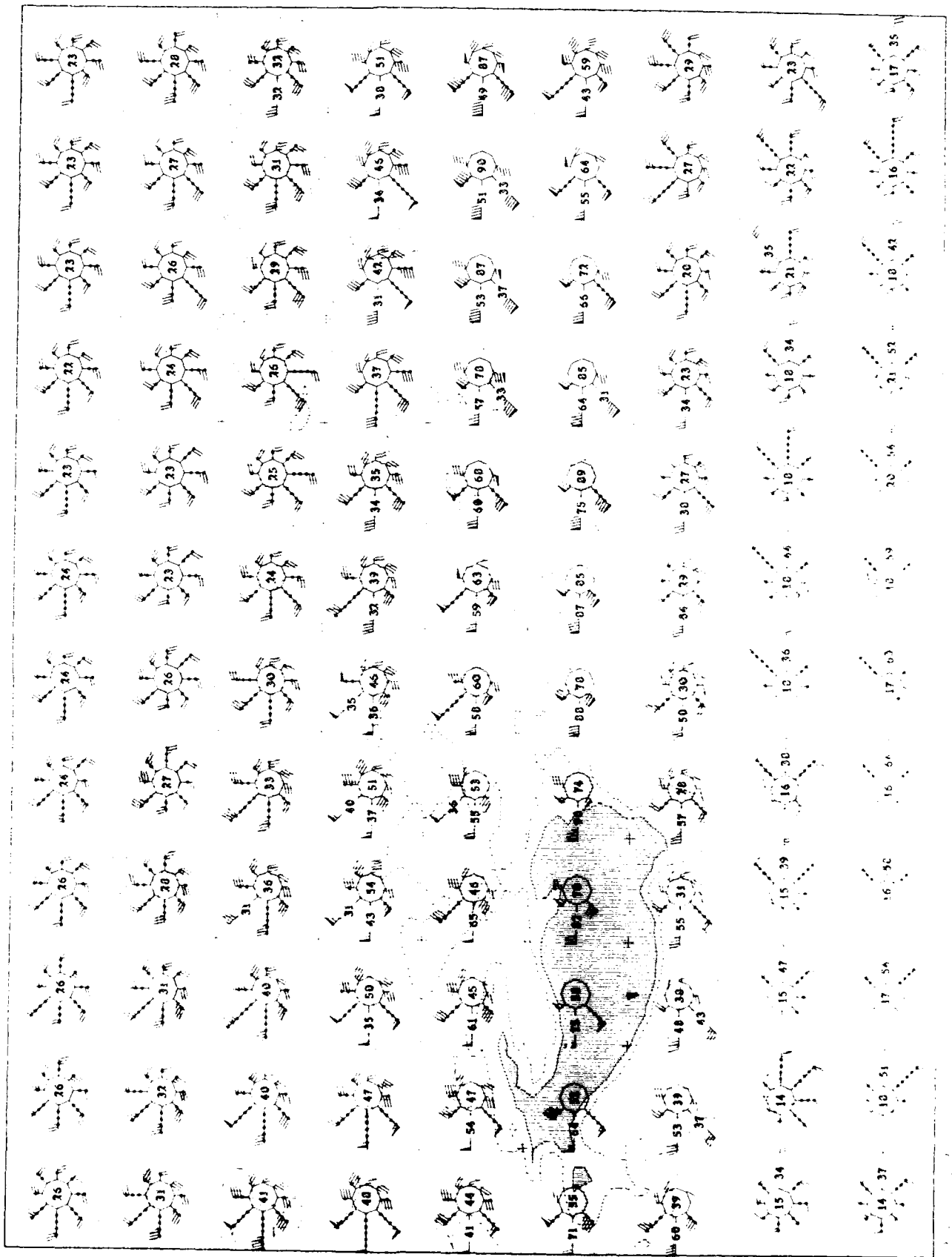
10-5-10
Wind Roses

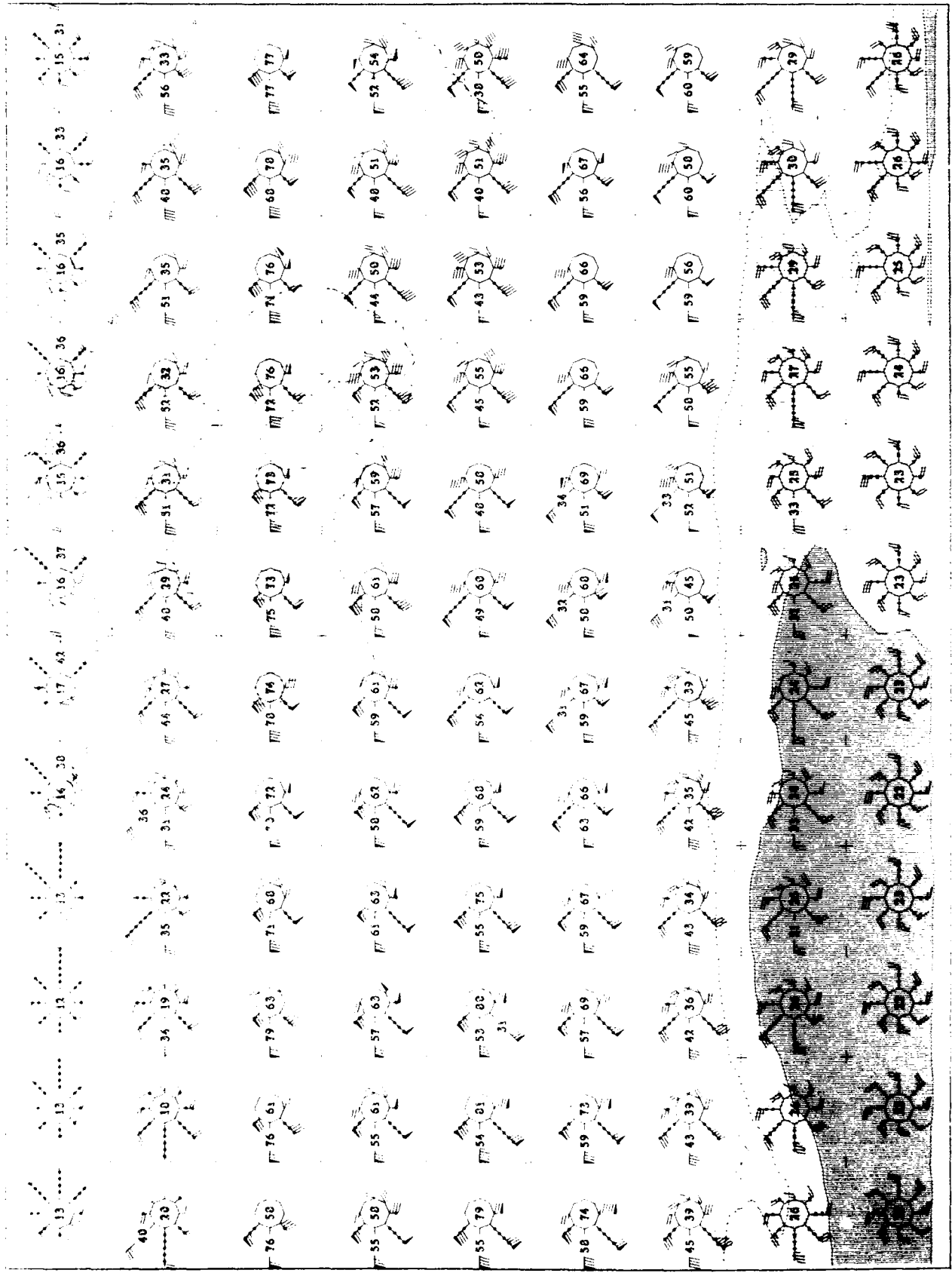




Upper Air Climatology
Southern Hemisphere

October 1953
250 MB





Upper Air Climatology
Southern Hemisphere

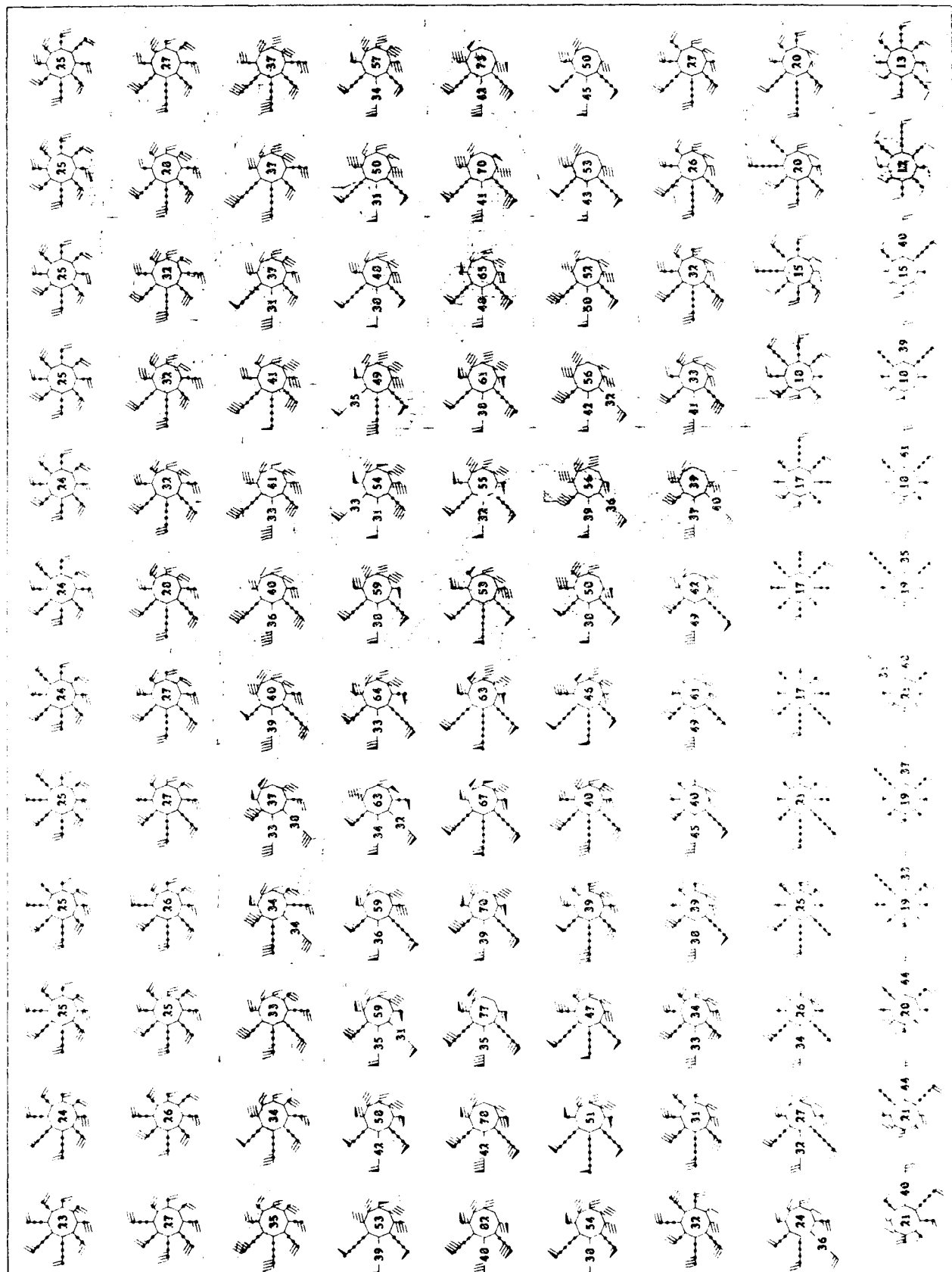
1970-1971
1972-1973

October
200 MB

Upper Air Climatology
Northern Hemisphere

1000 mb
Wind Vector

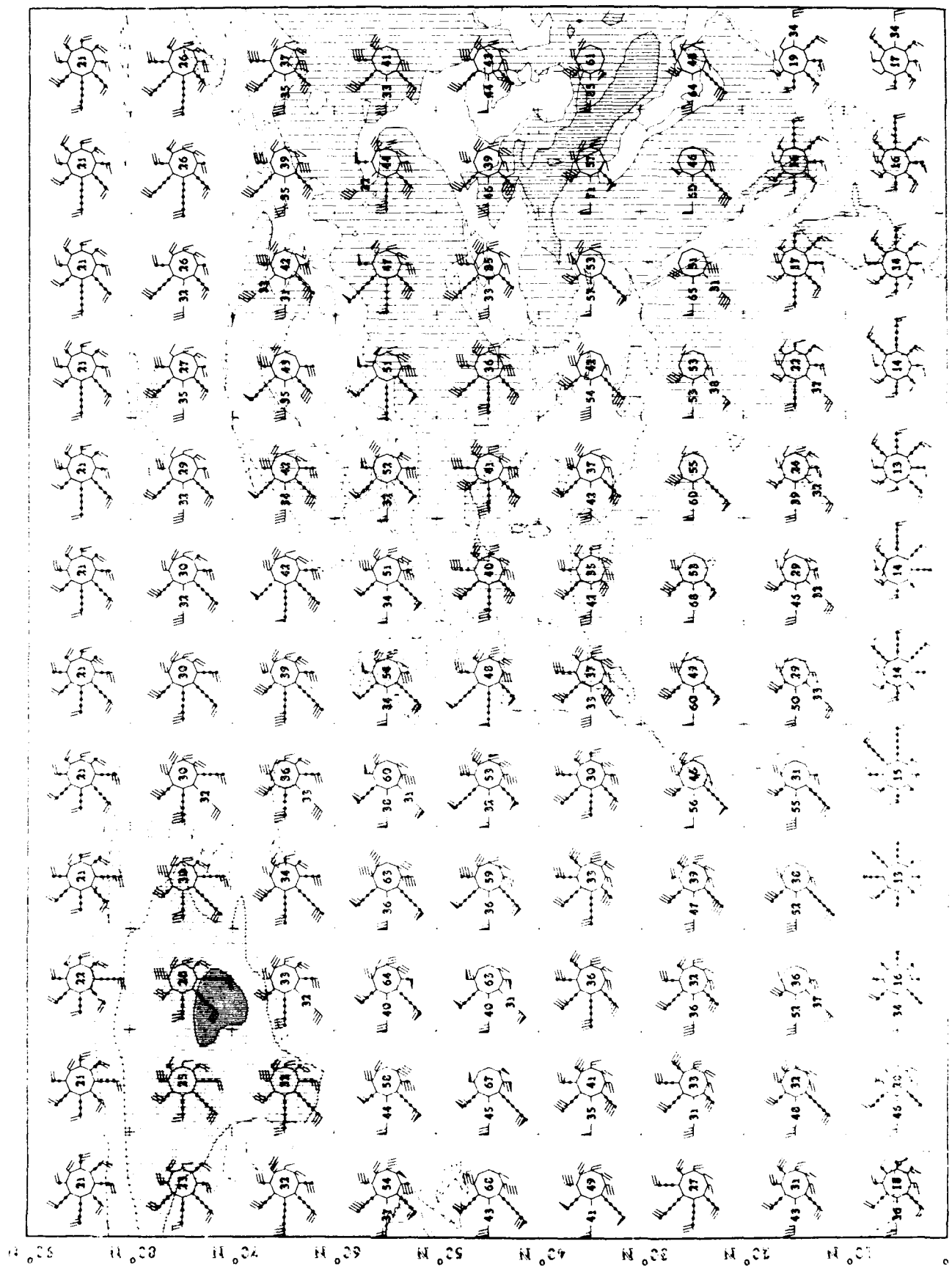
1000 mb
1000 mb

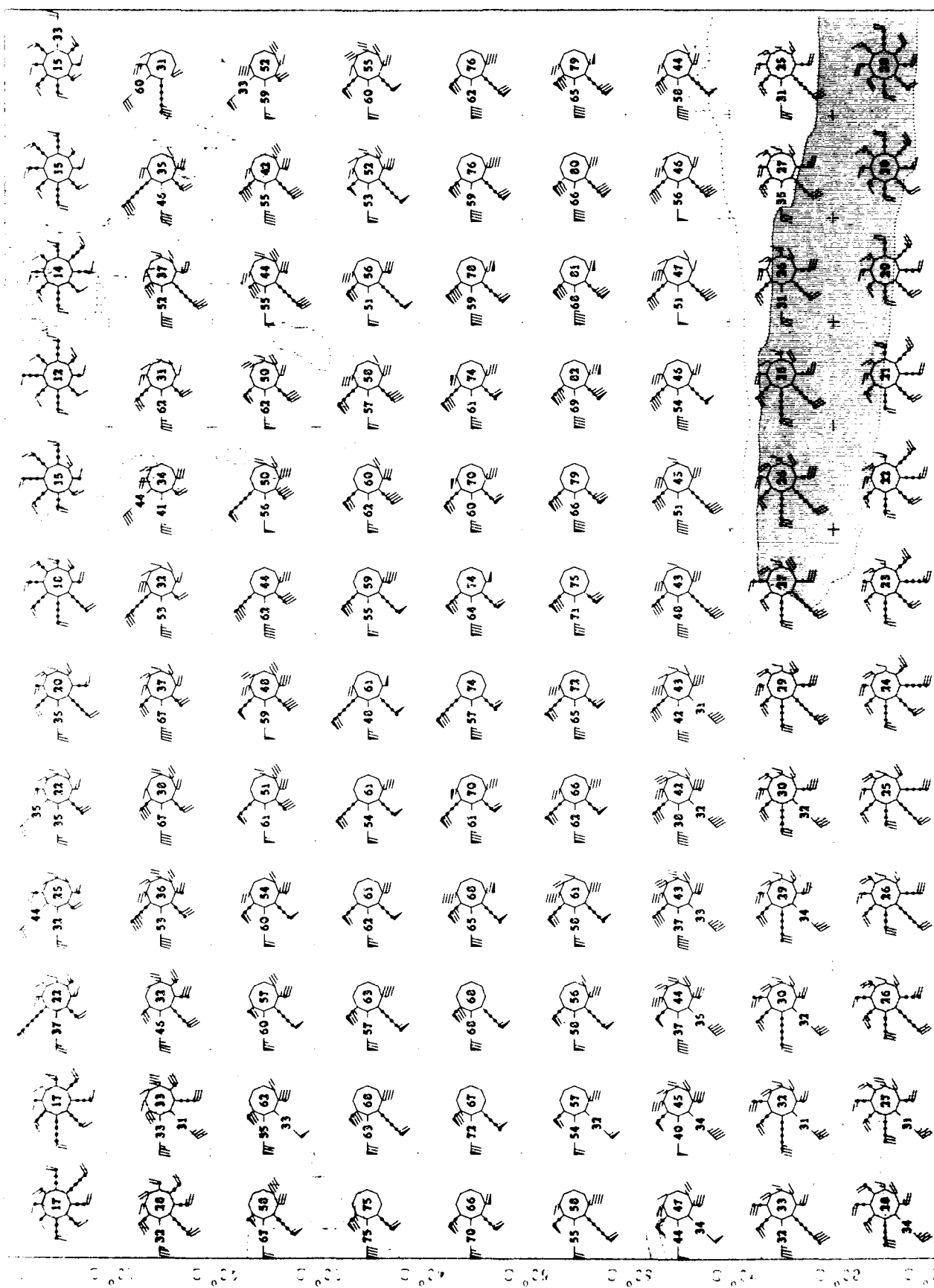


Upper Air Climatology Northern Hemisphere

500 mb
Wind Roses

500 mb
Wind Roses

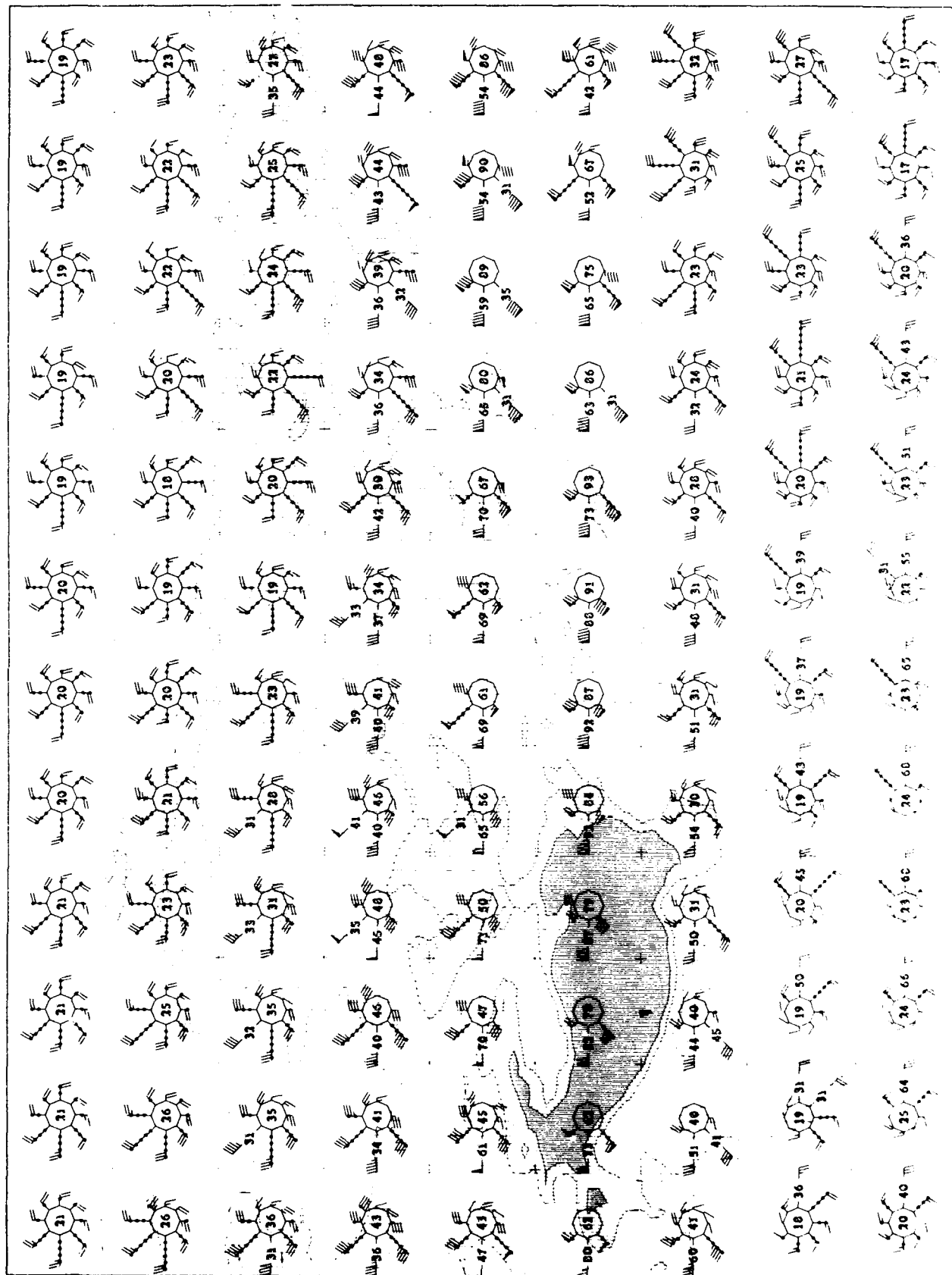


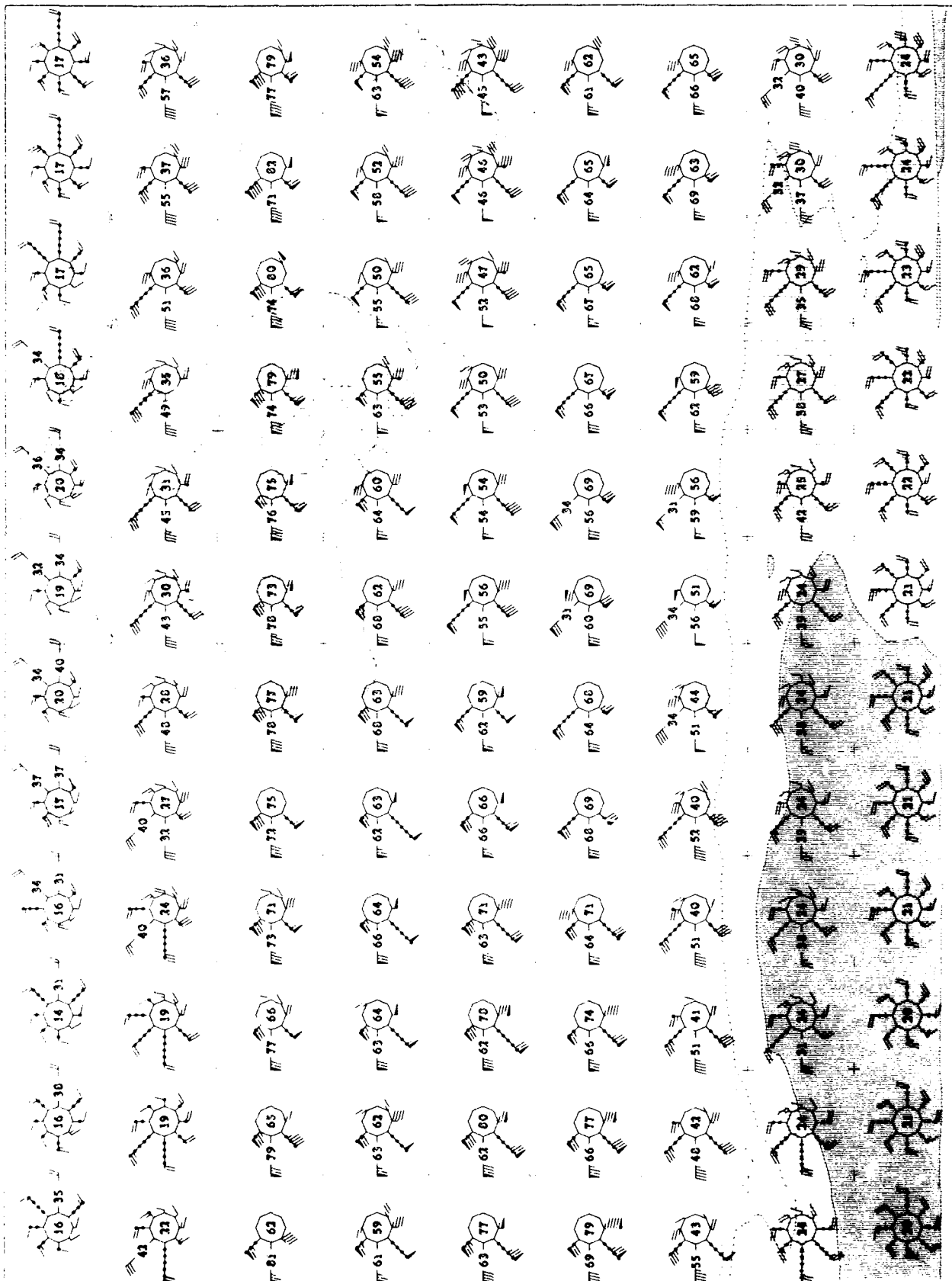


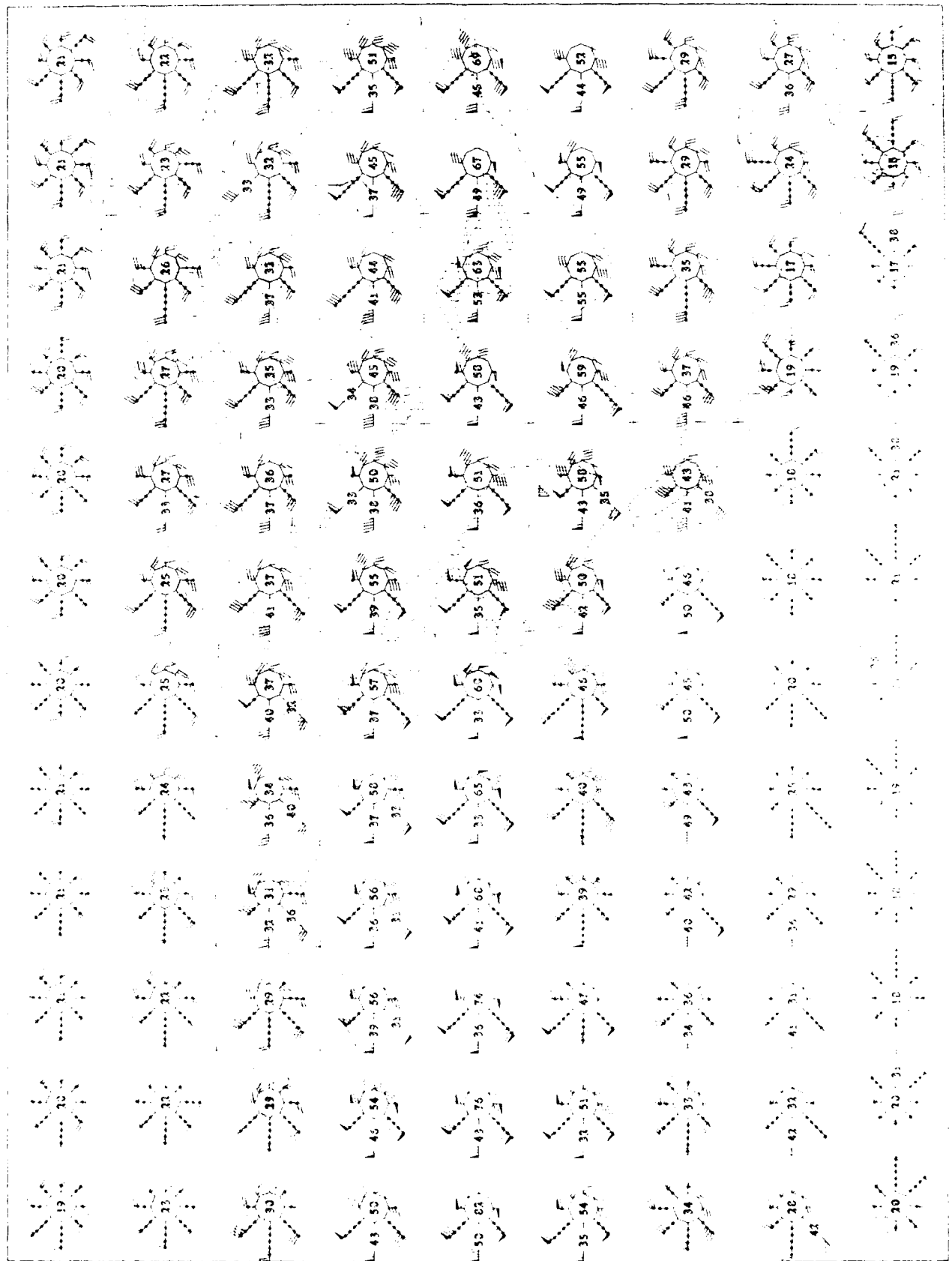
October
200 Mb

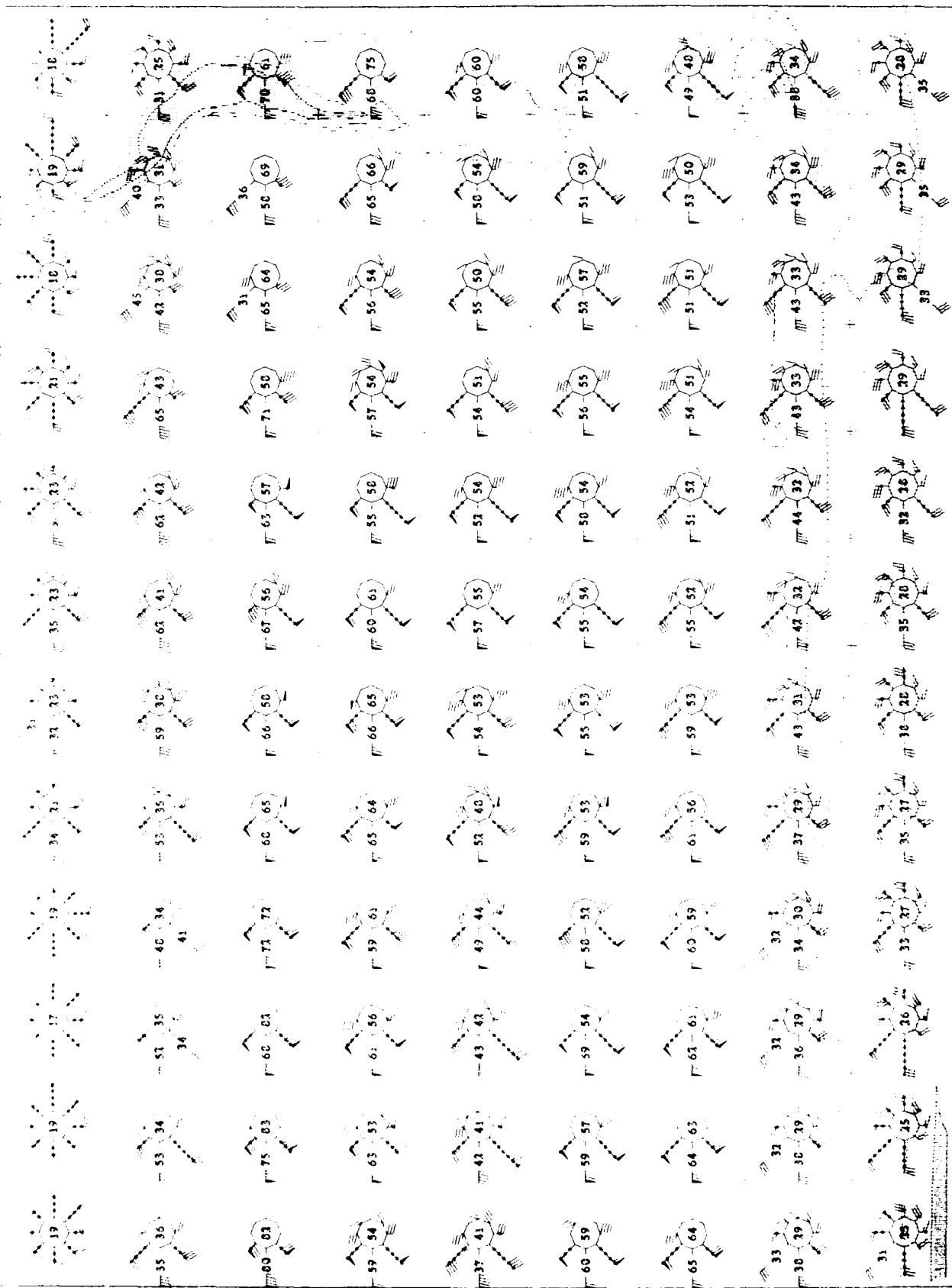
60E TO 180E
Wind Roses

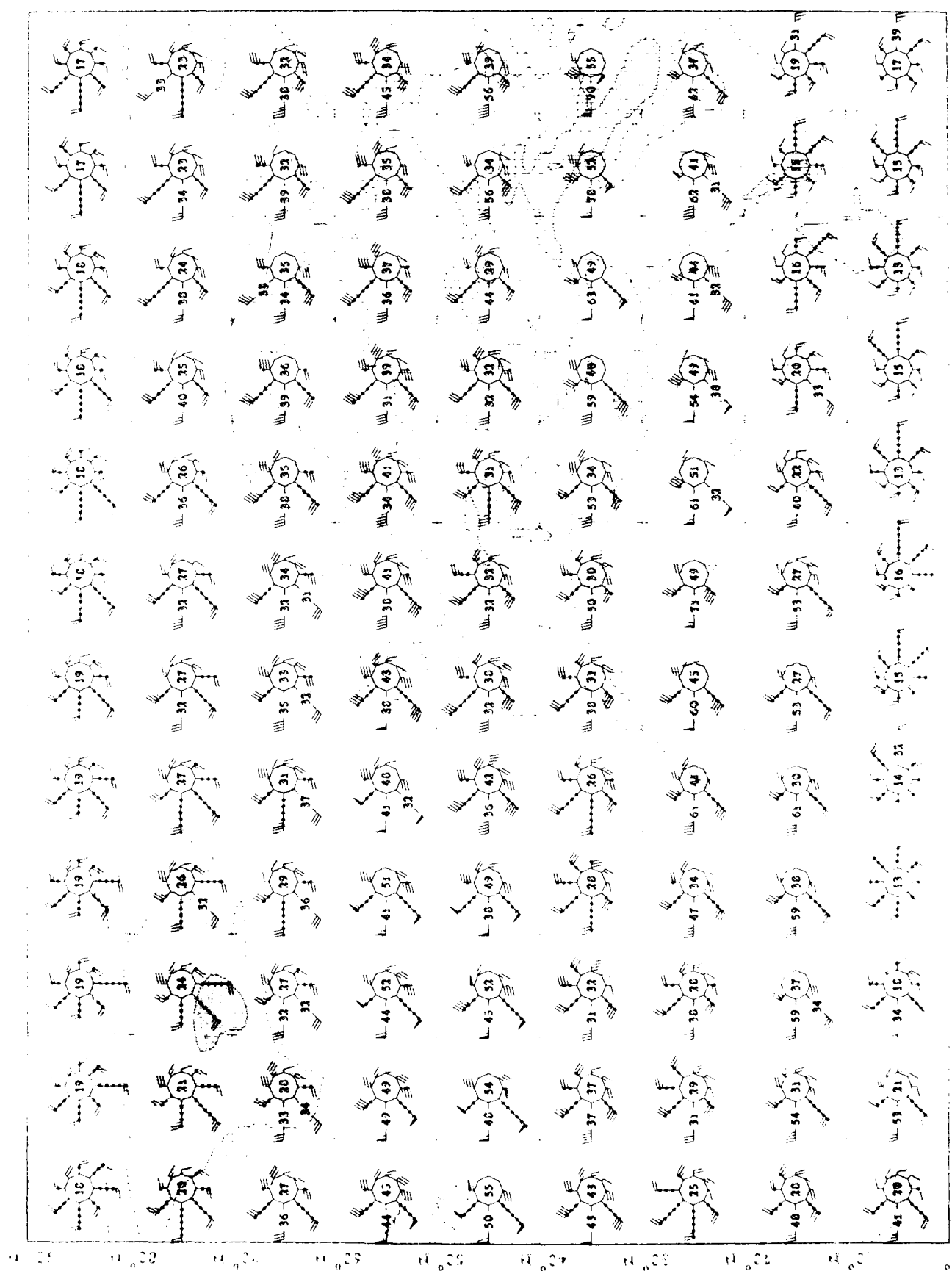
Upper Air Climatology
Northern Hemisphere

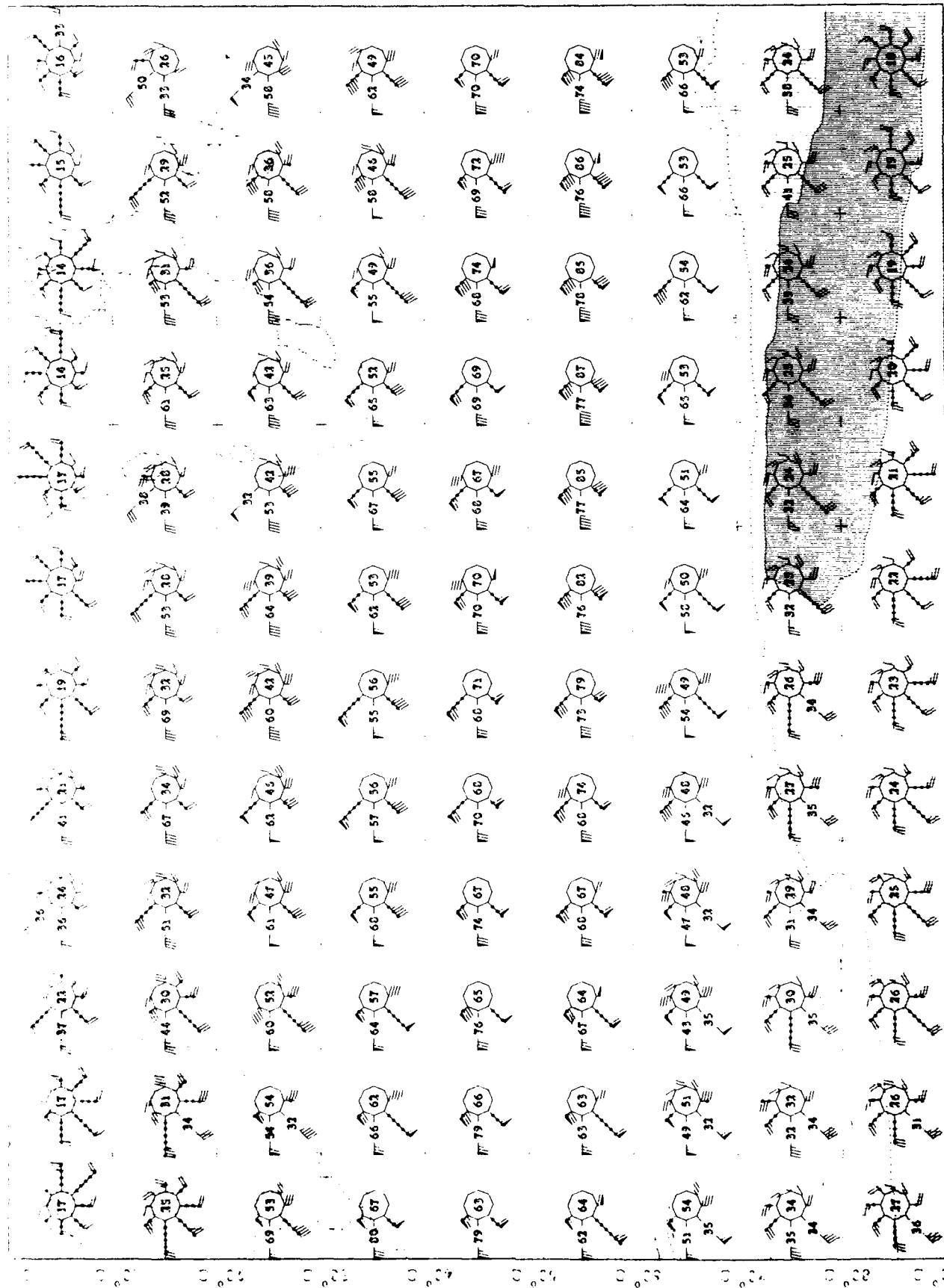








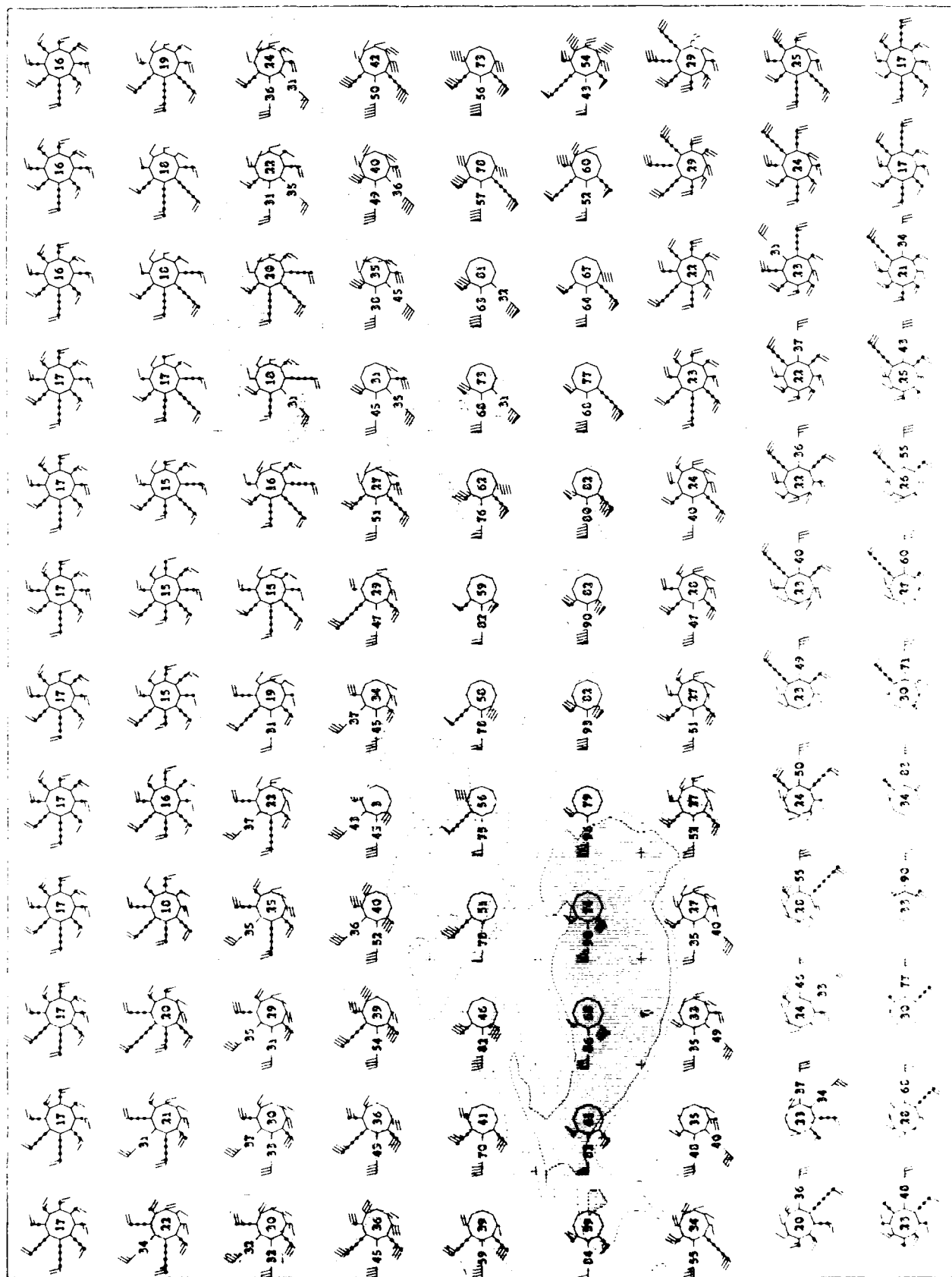


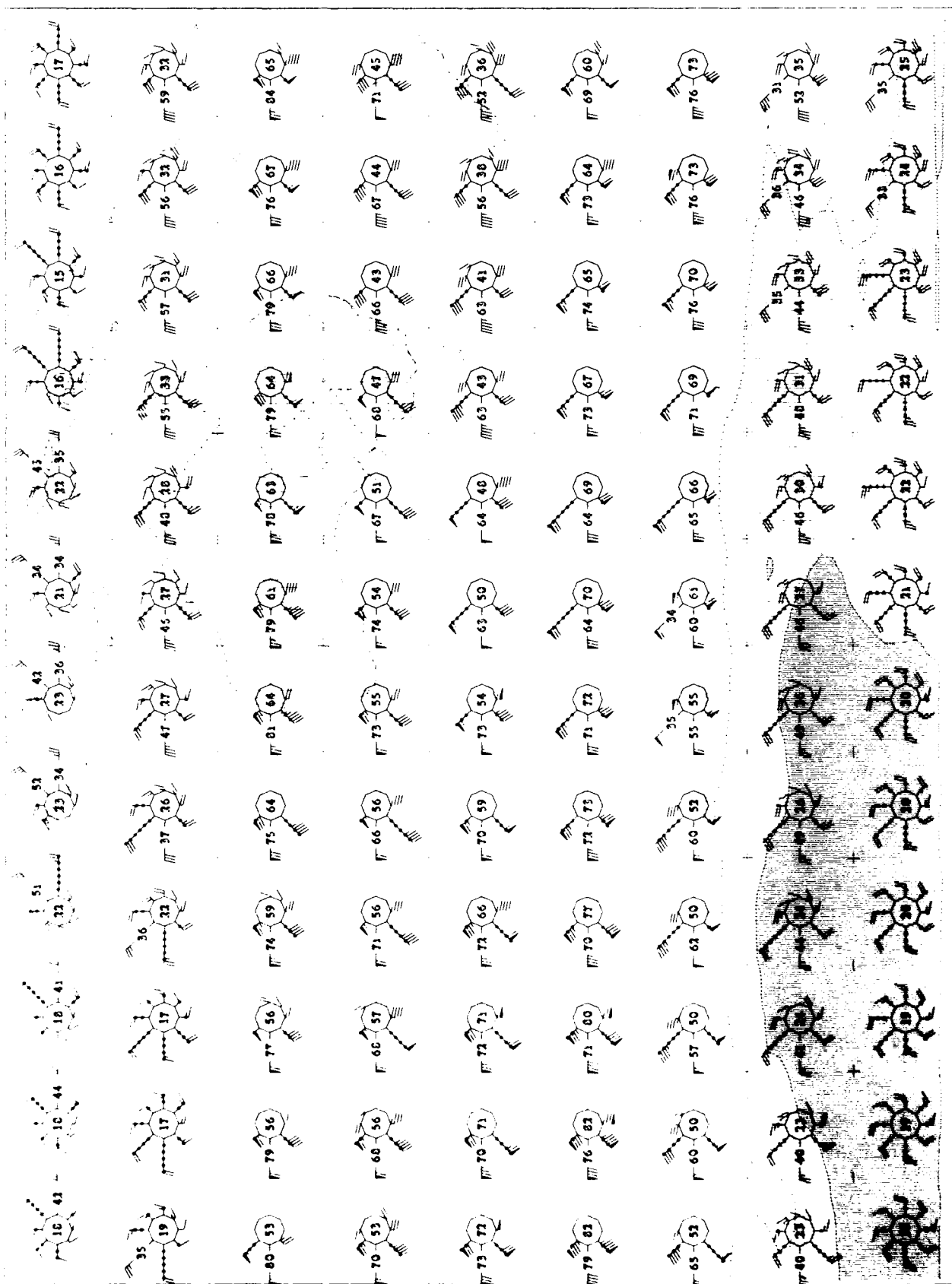


Upper Air Climatology
Northern Hemisphere

500 mb 1000
Wind Roses

Contour
150 Miles



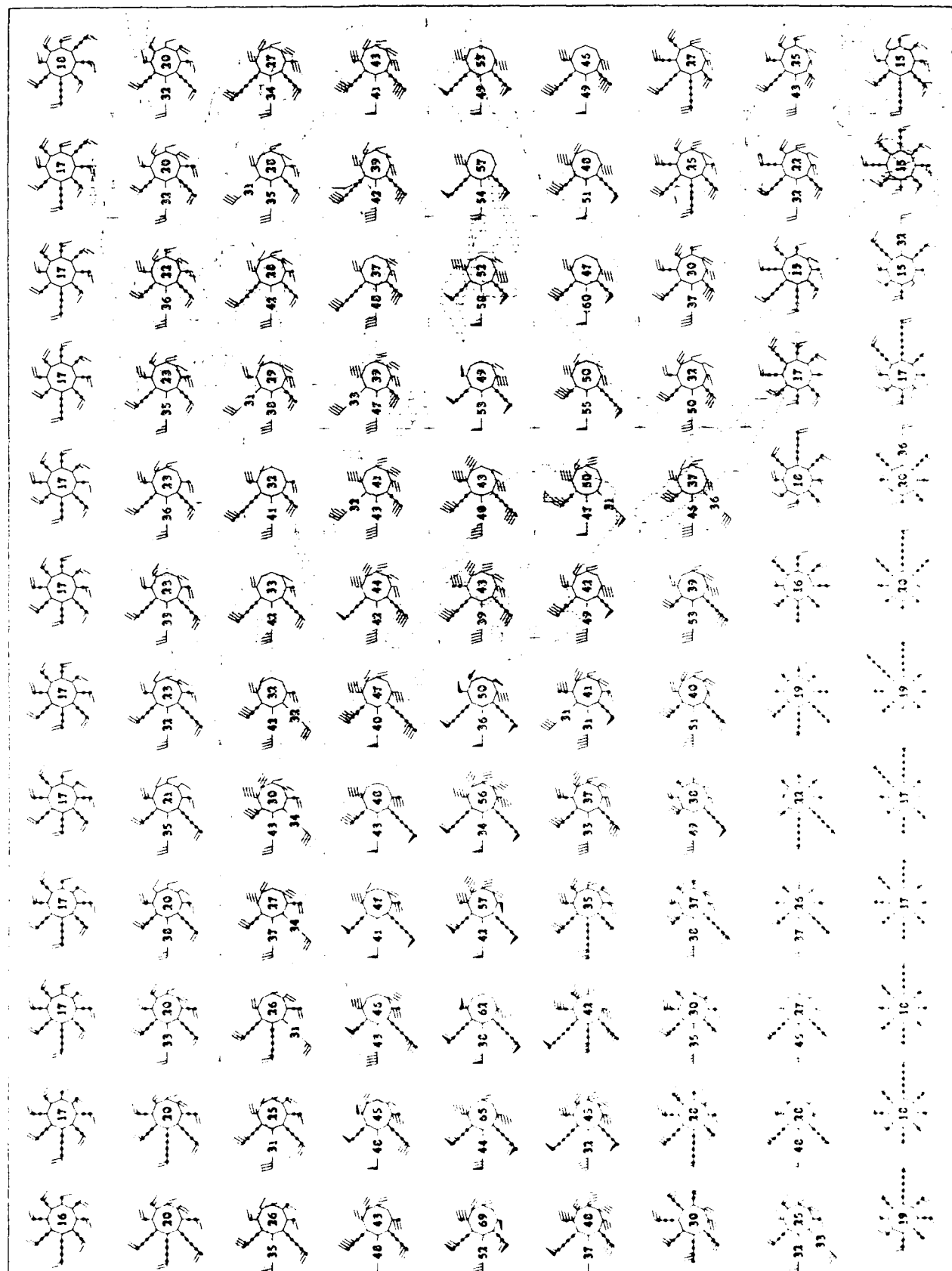


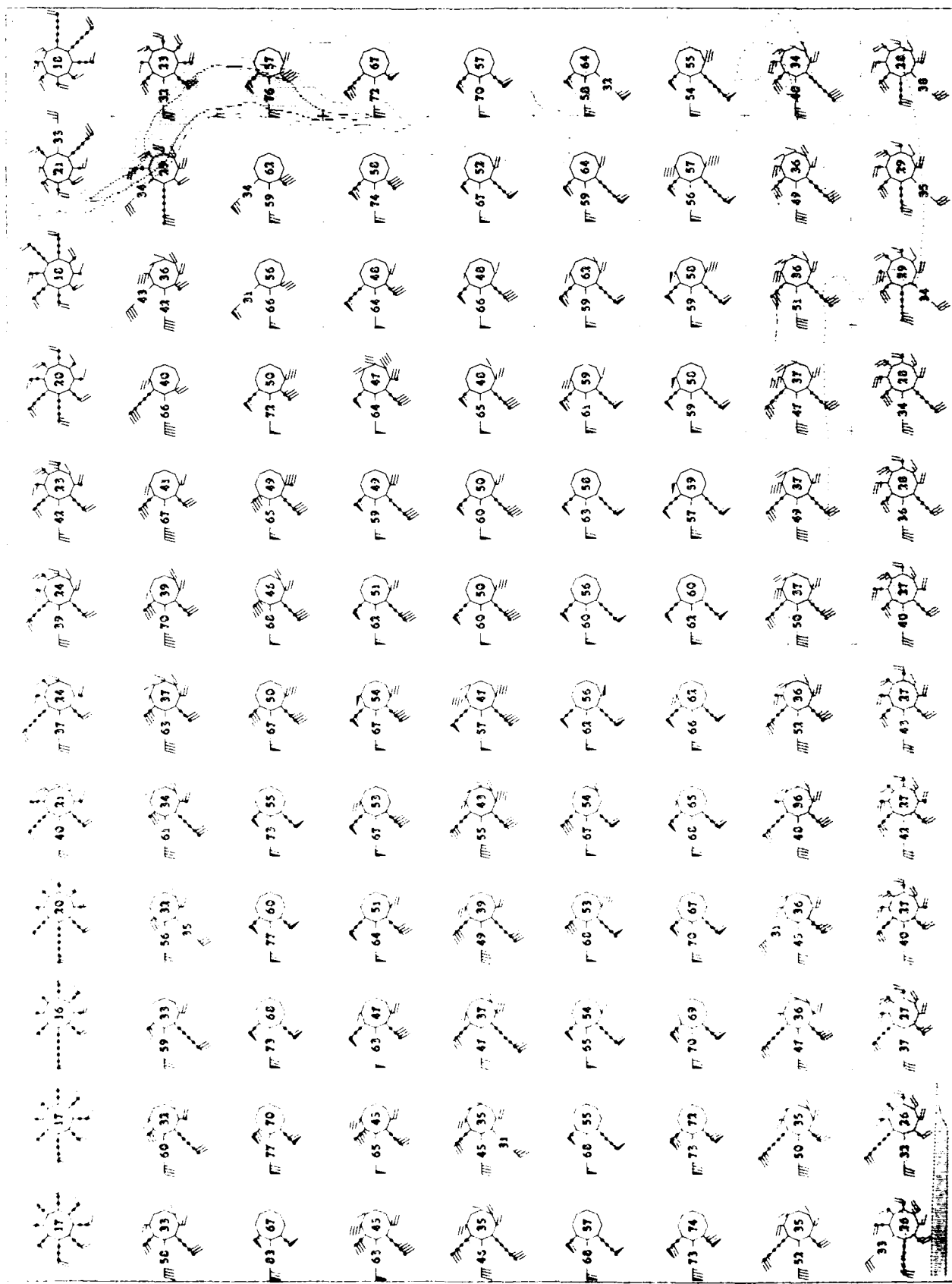
Upper Air Climatology
Southern Hemisphere

NOV 1908
World Record

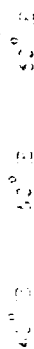
October
150 Mb

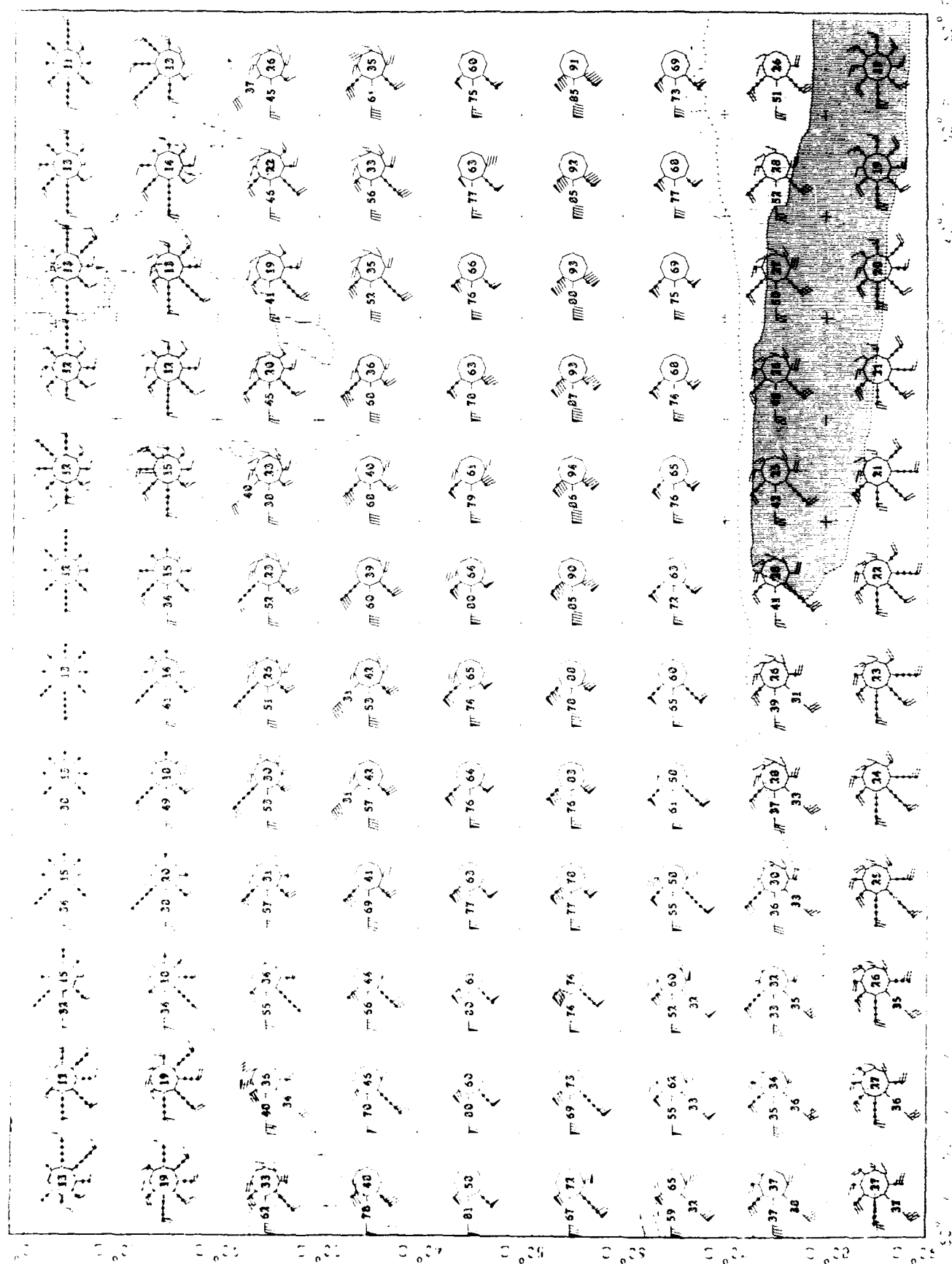
150 MS
- 150 MS





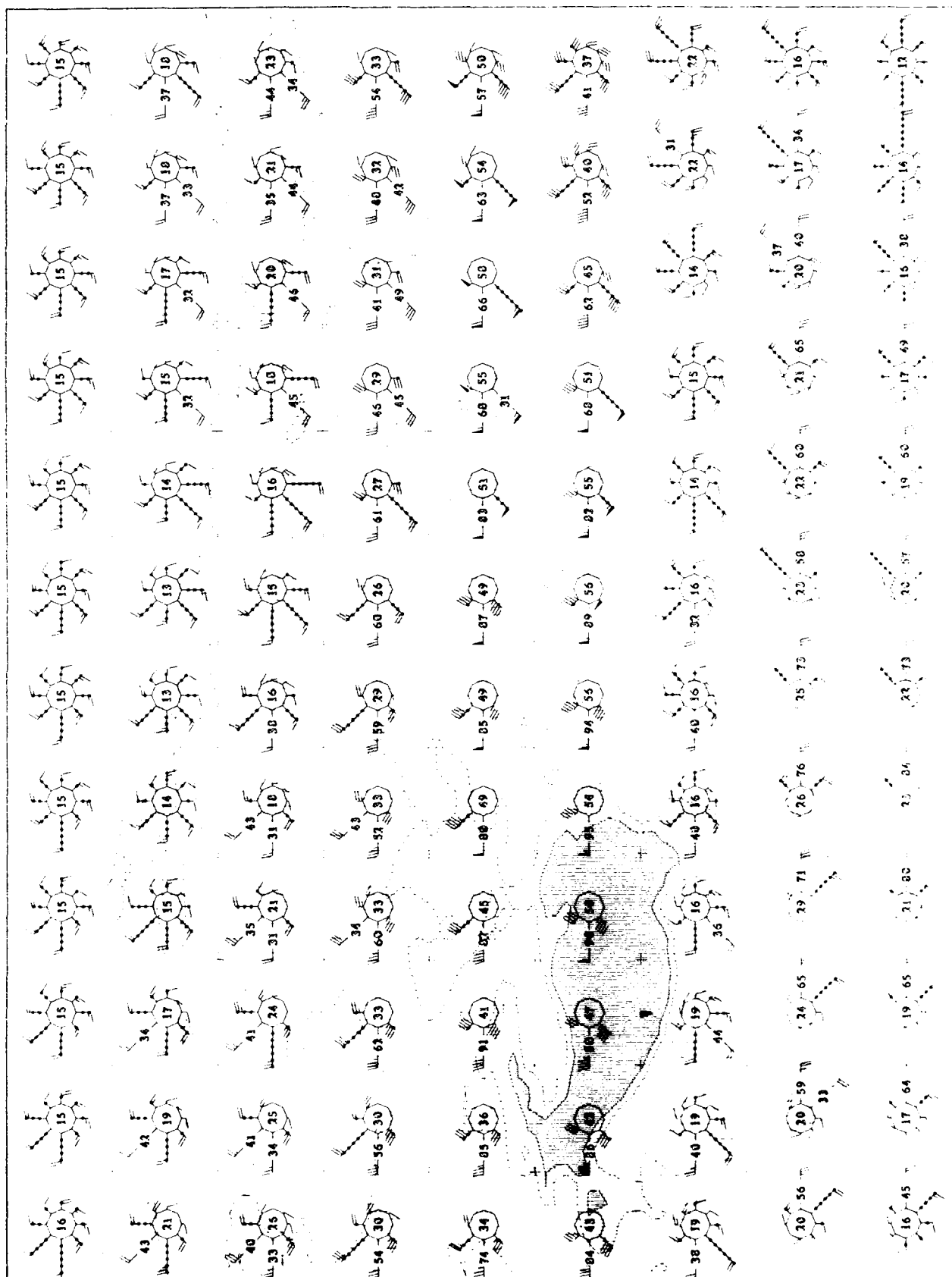
1990

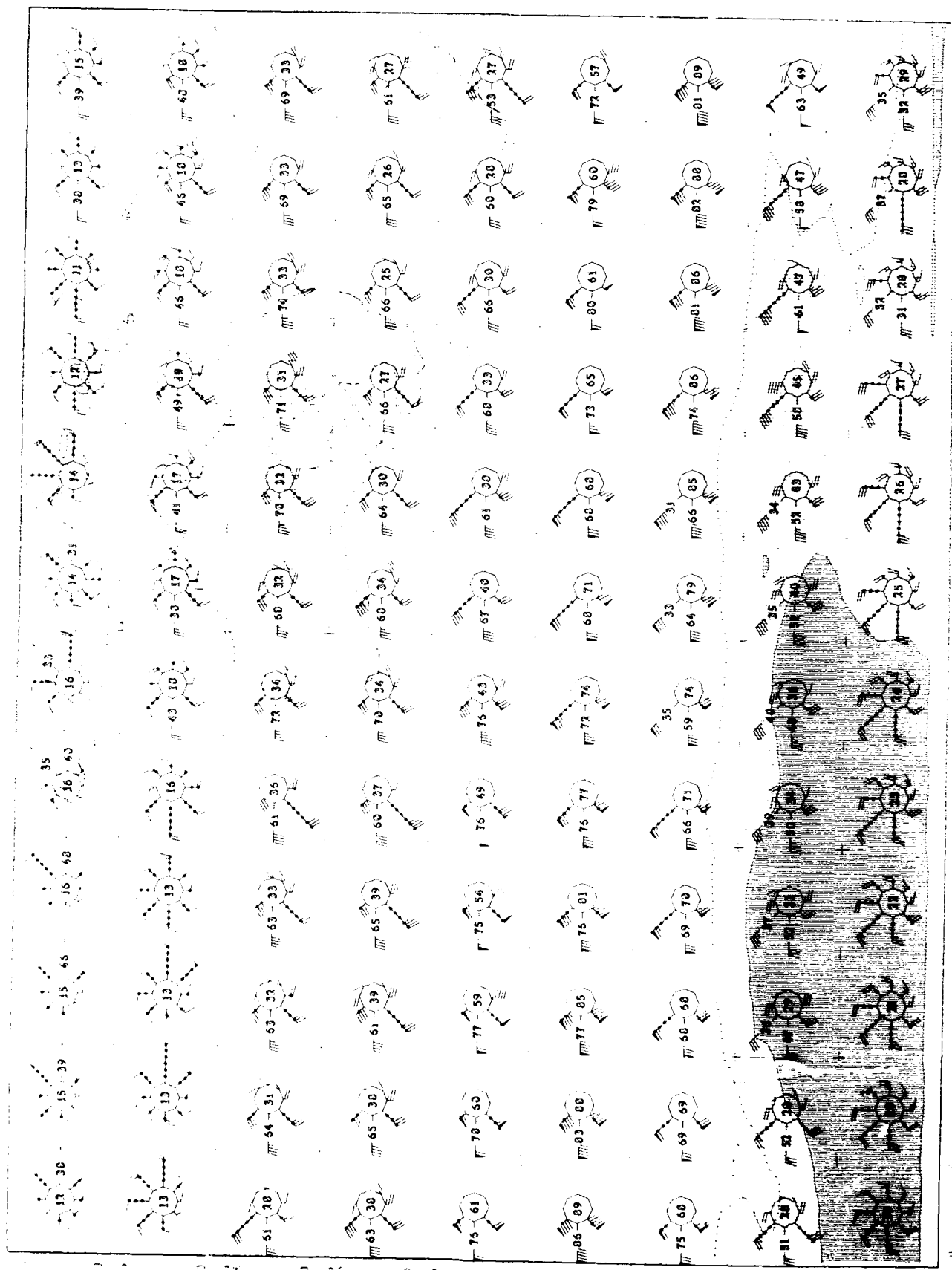




Upper and Lower Hemisphere Northern Hemisphere

June 19, 1892
Wind Roses

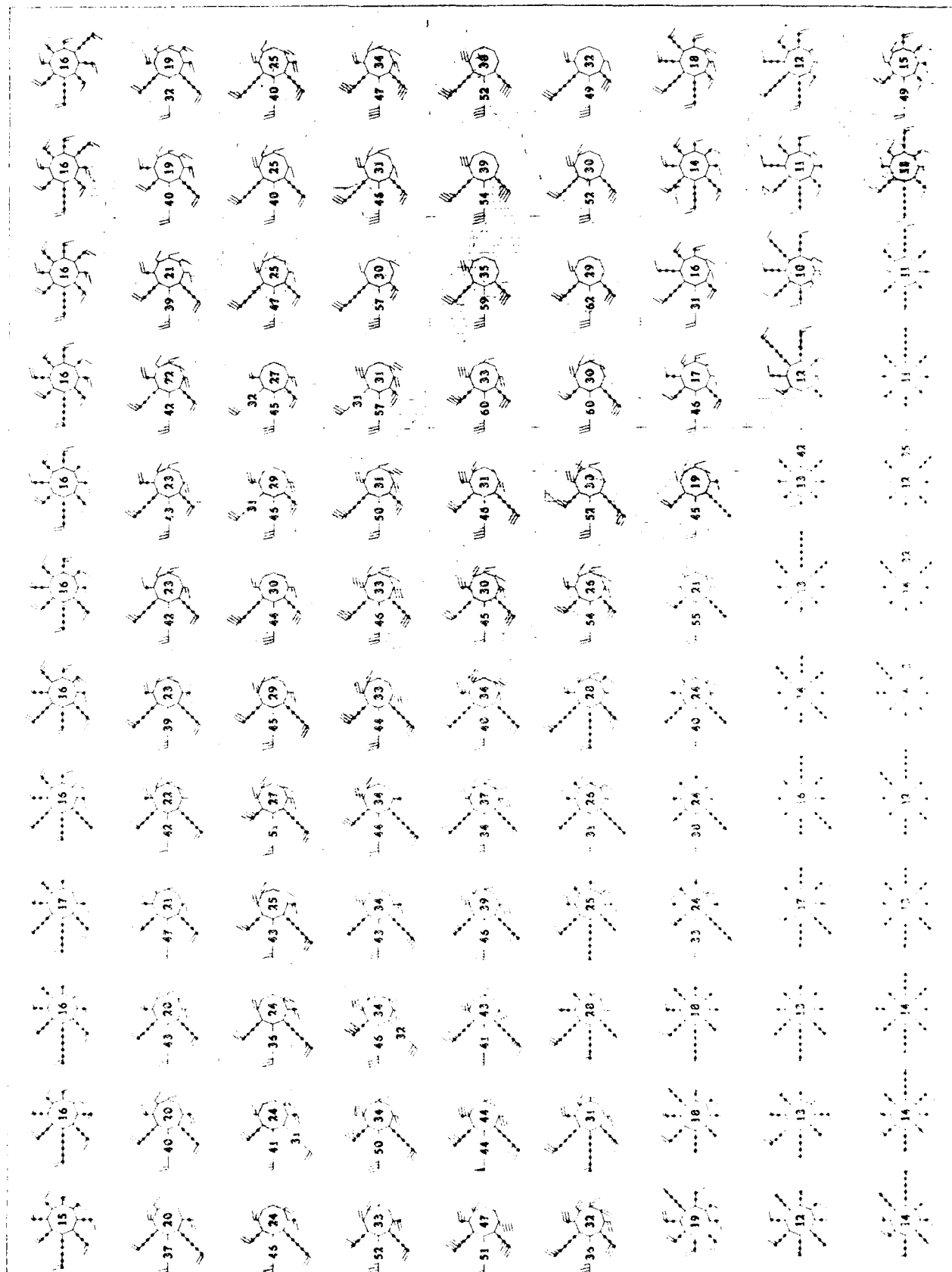


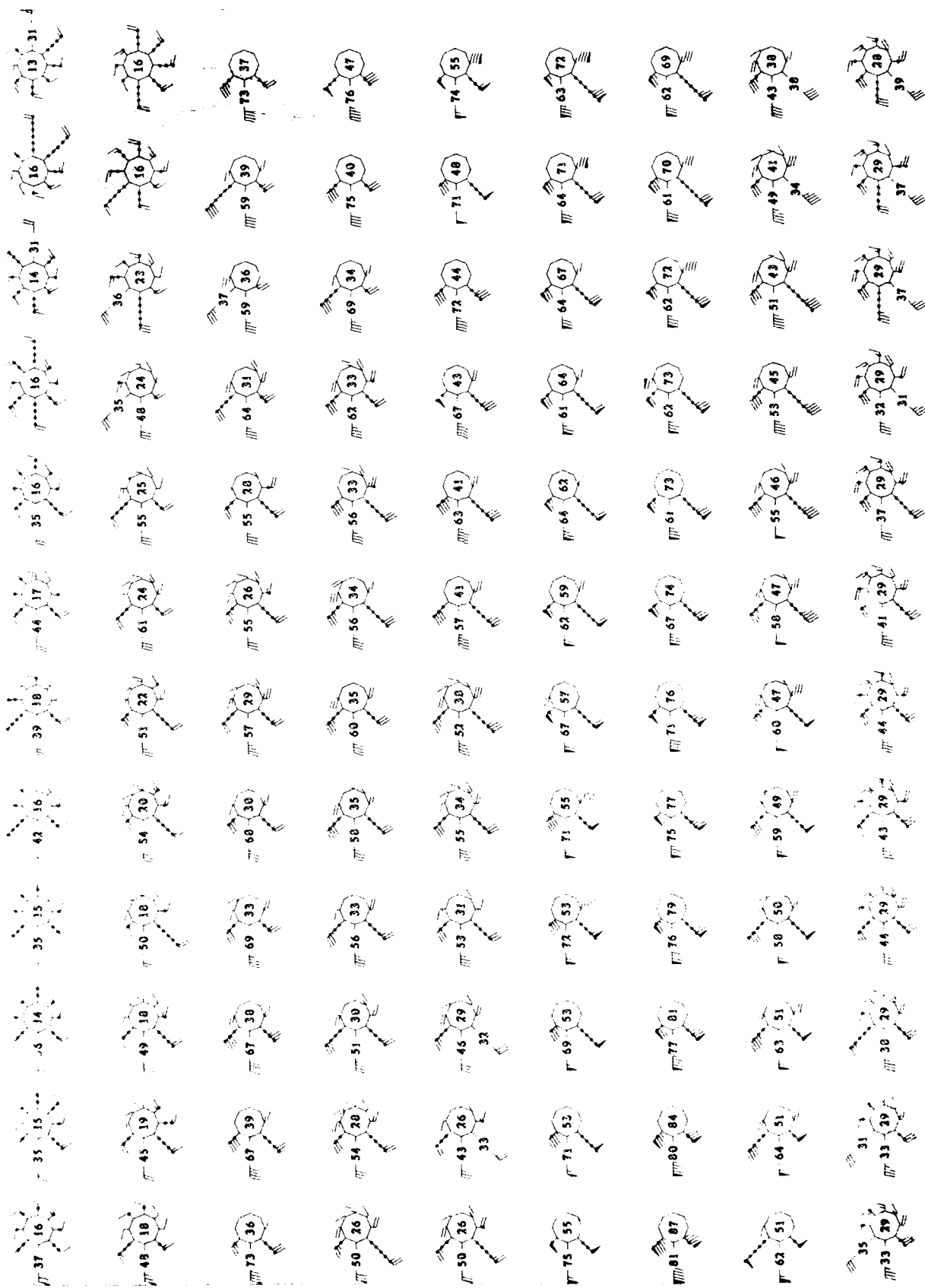


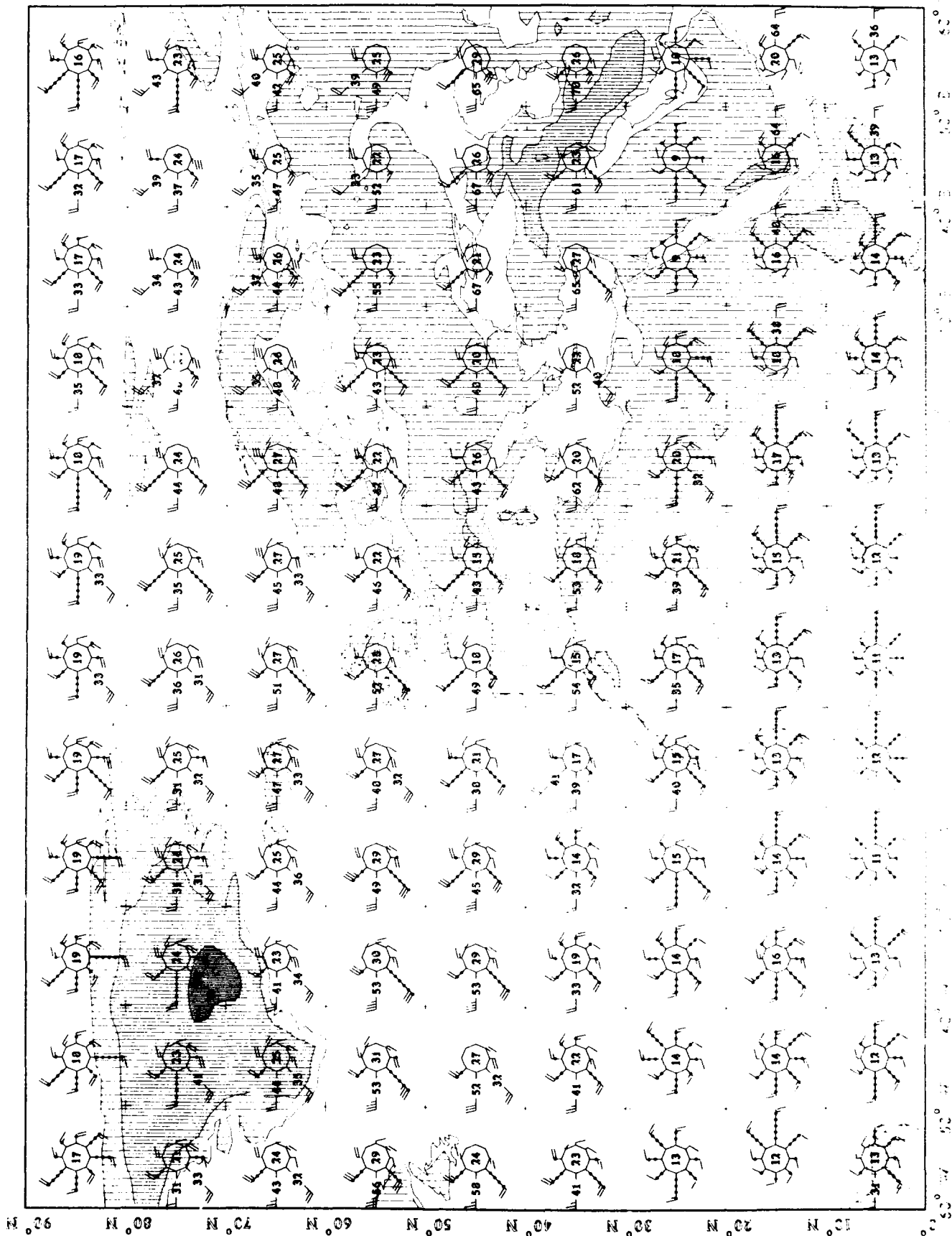
Upper and Lower
Northern Hemisphere

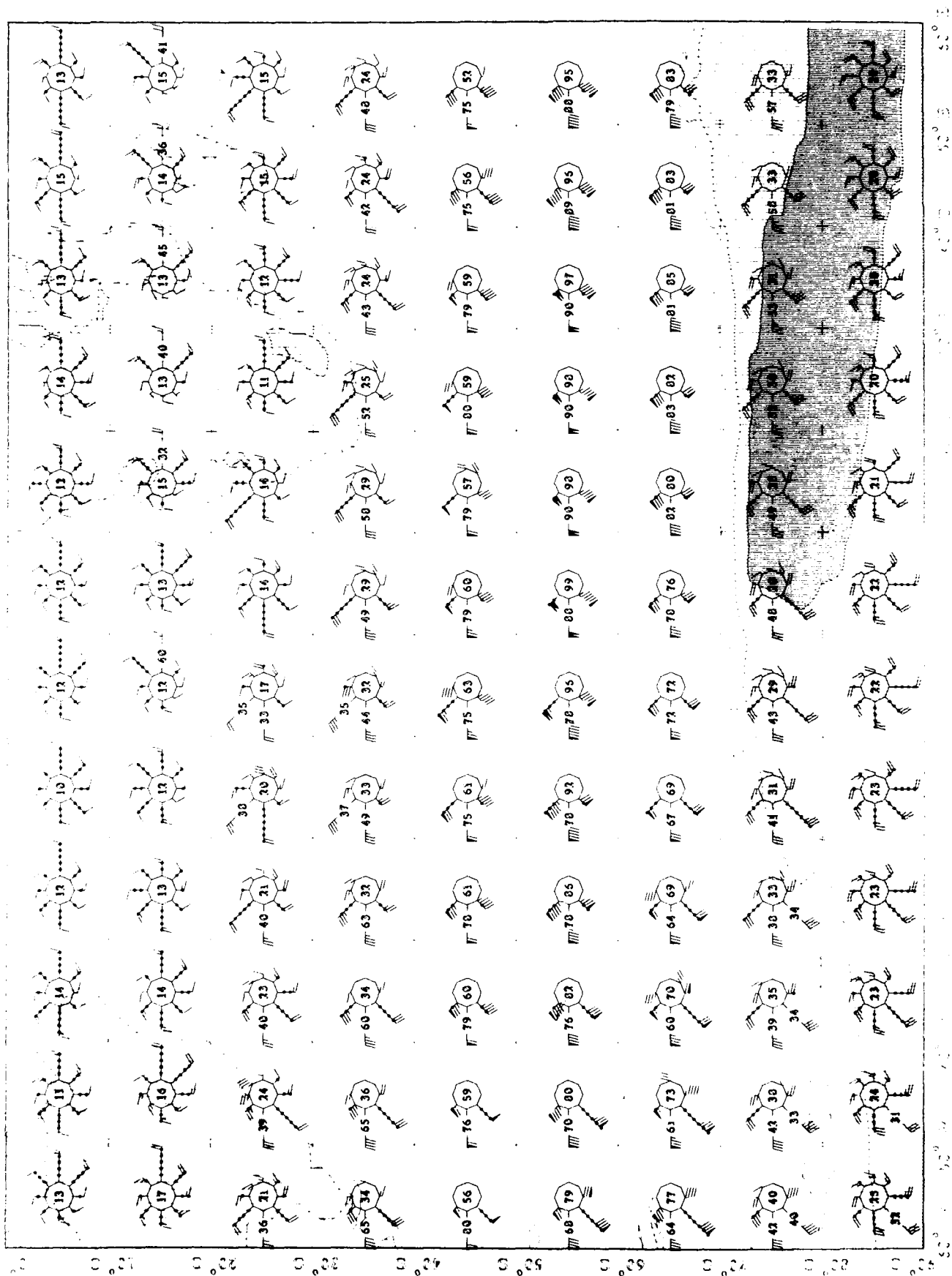
2000 1000
1000 1000

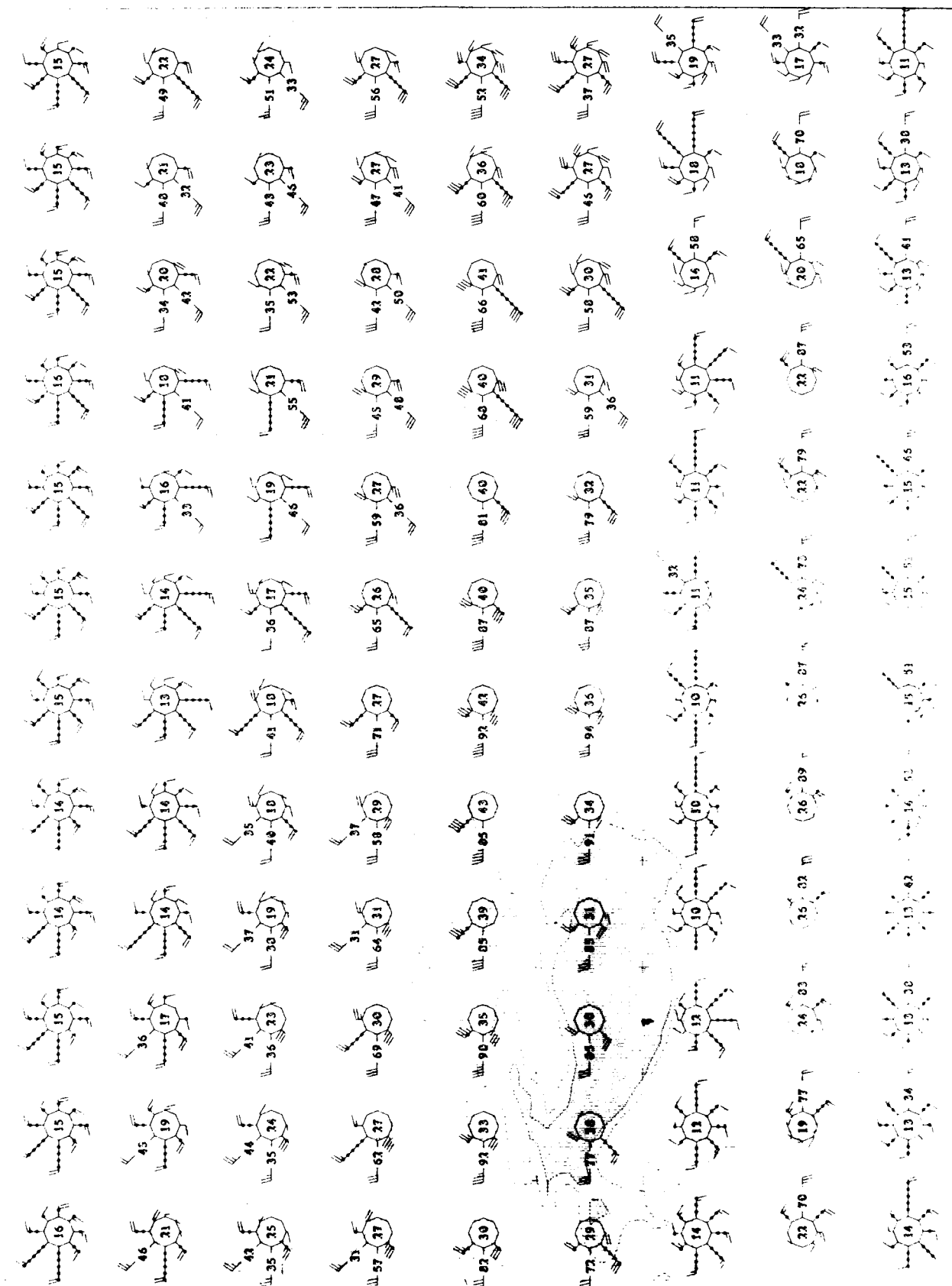
1000 1000
1000 1000

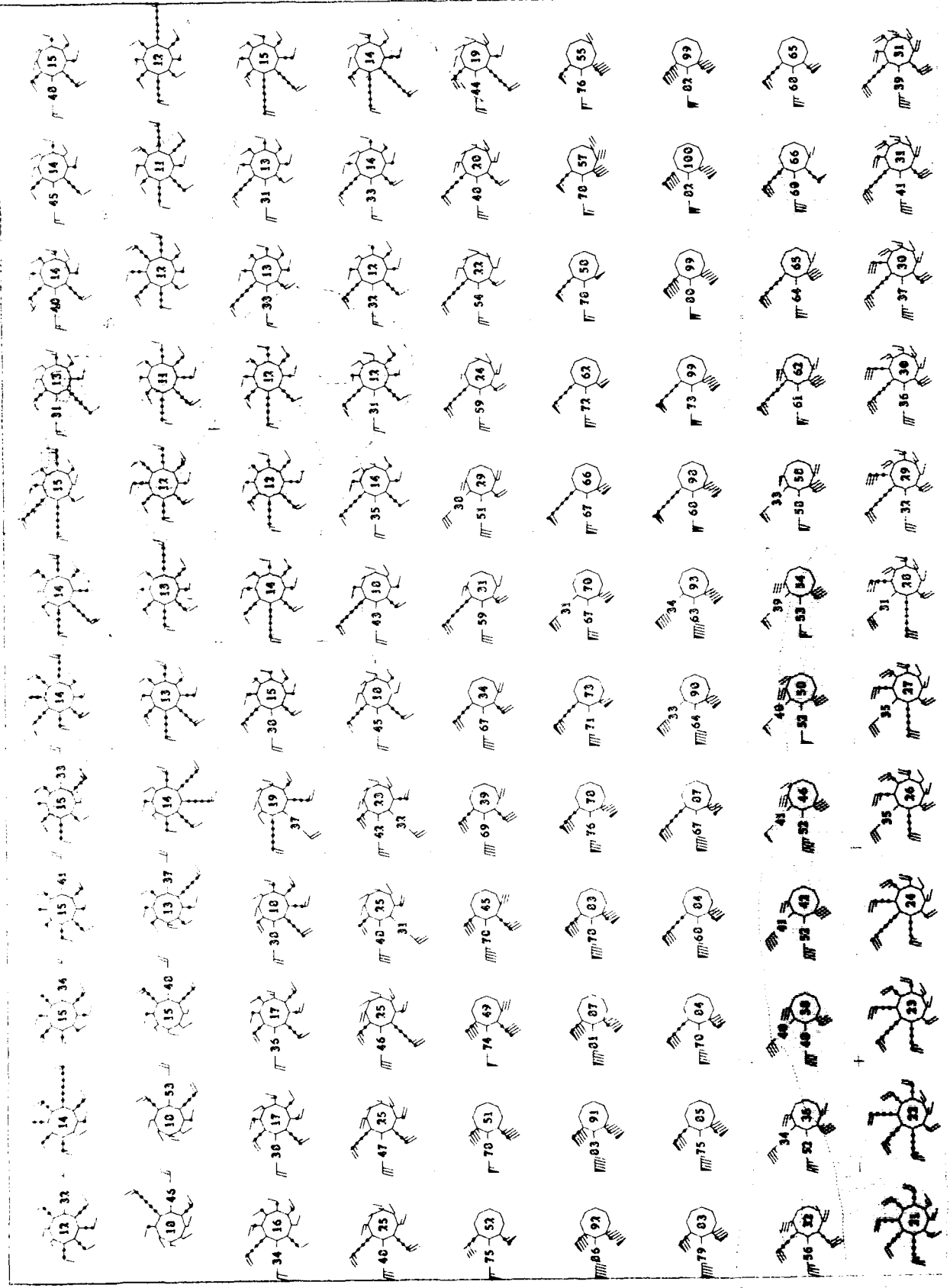








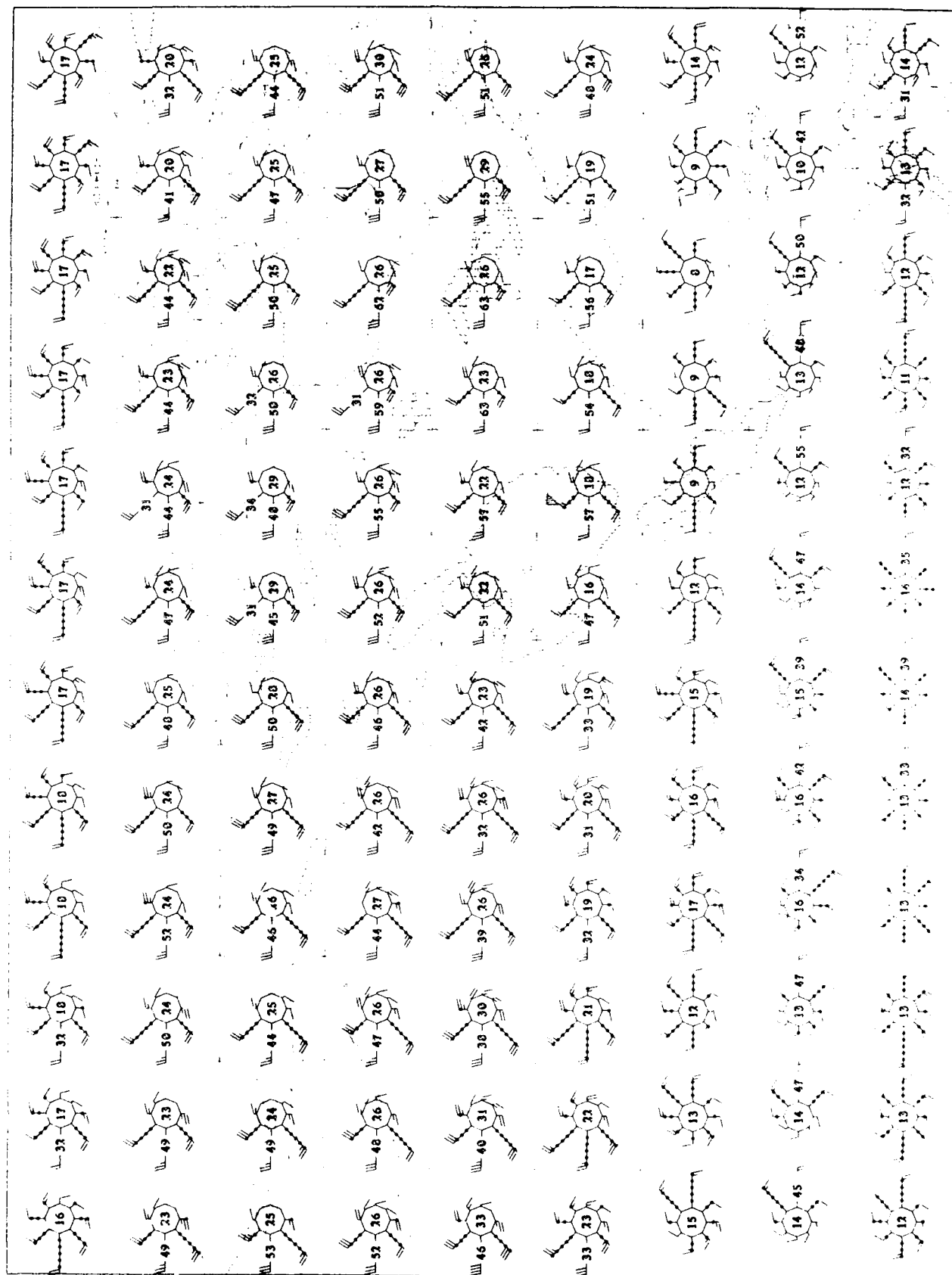


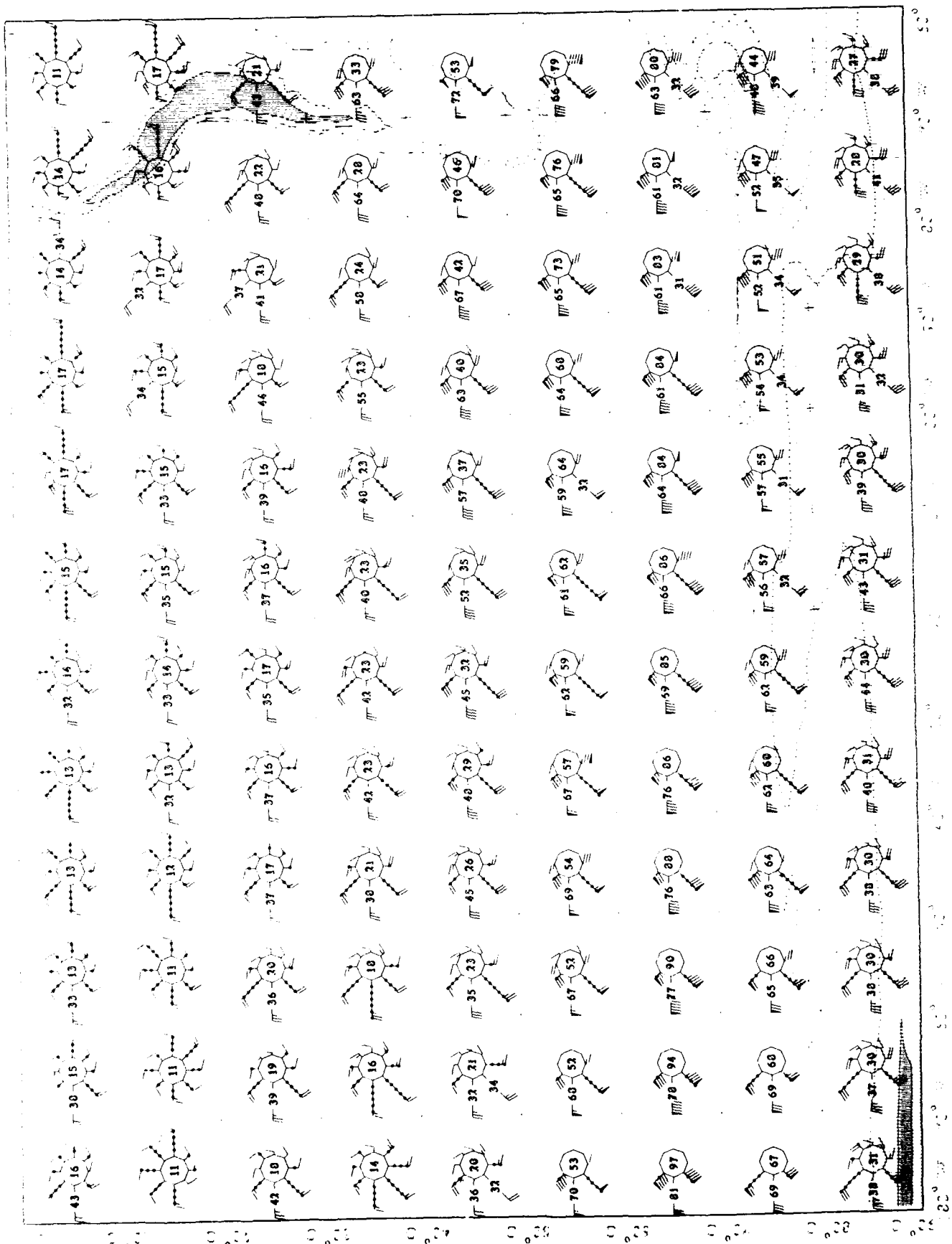


Upper Air Climatology
Southern Hemisphere

1000 hPa
1000 hPa

0000Z
70 MD

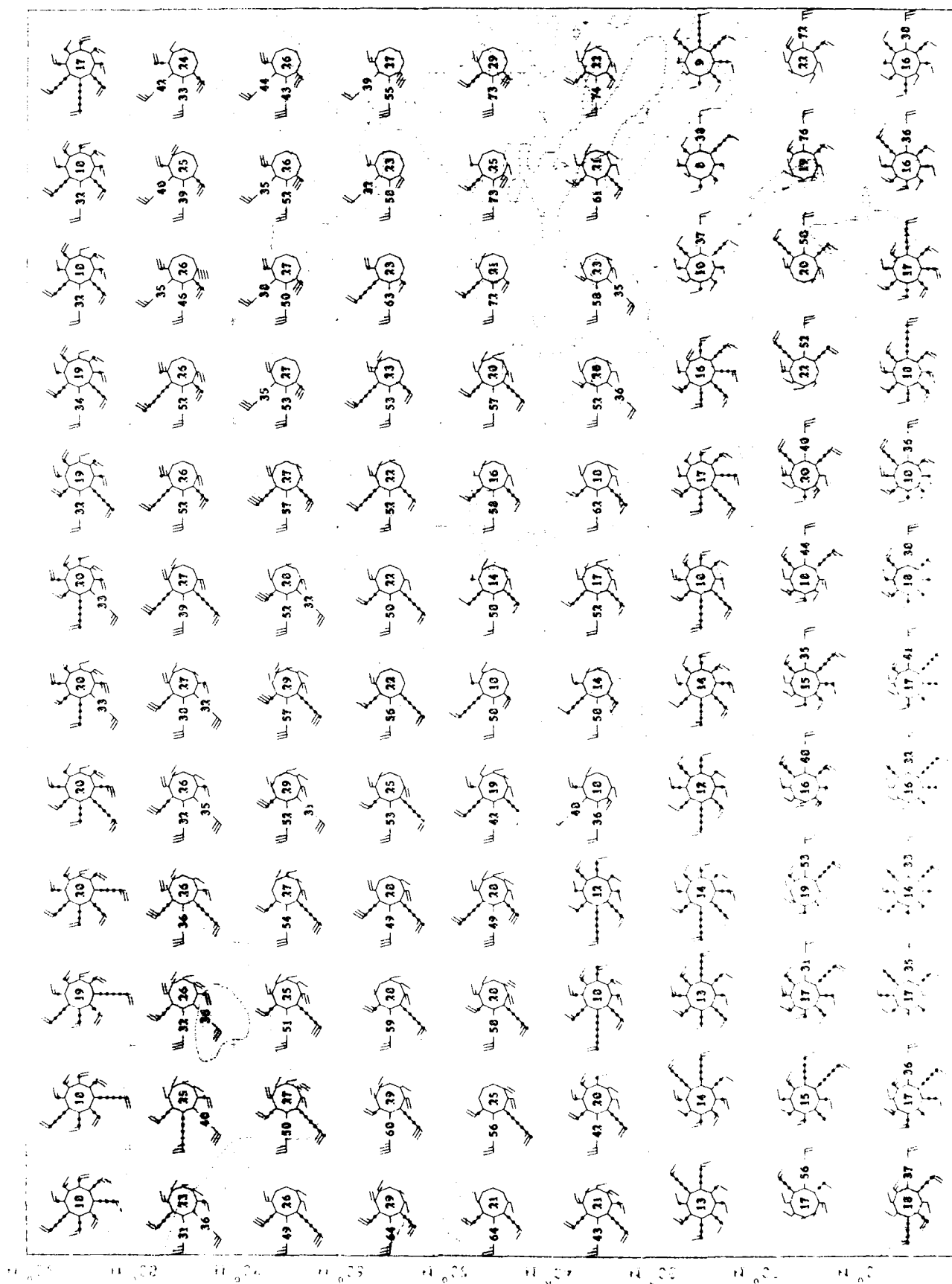


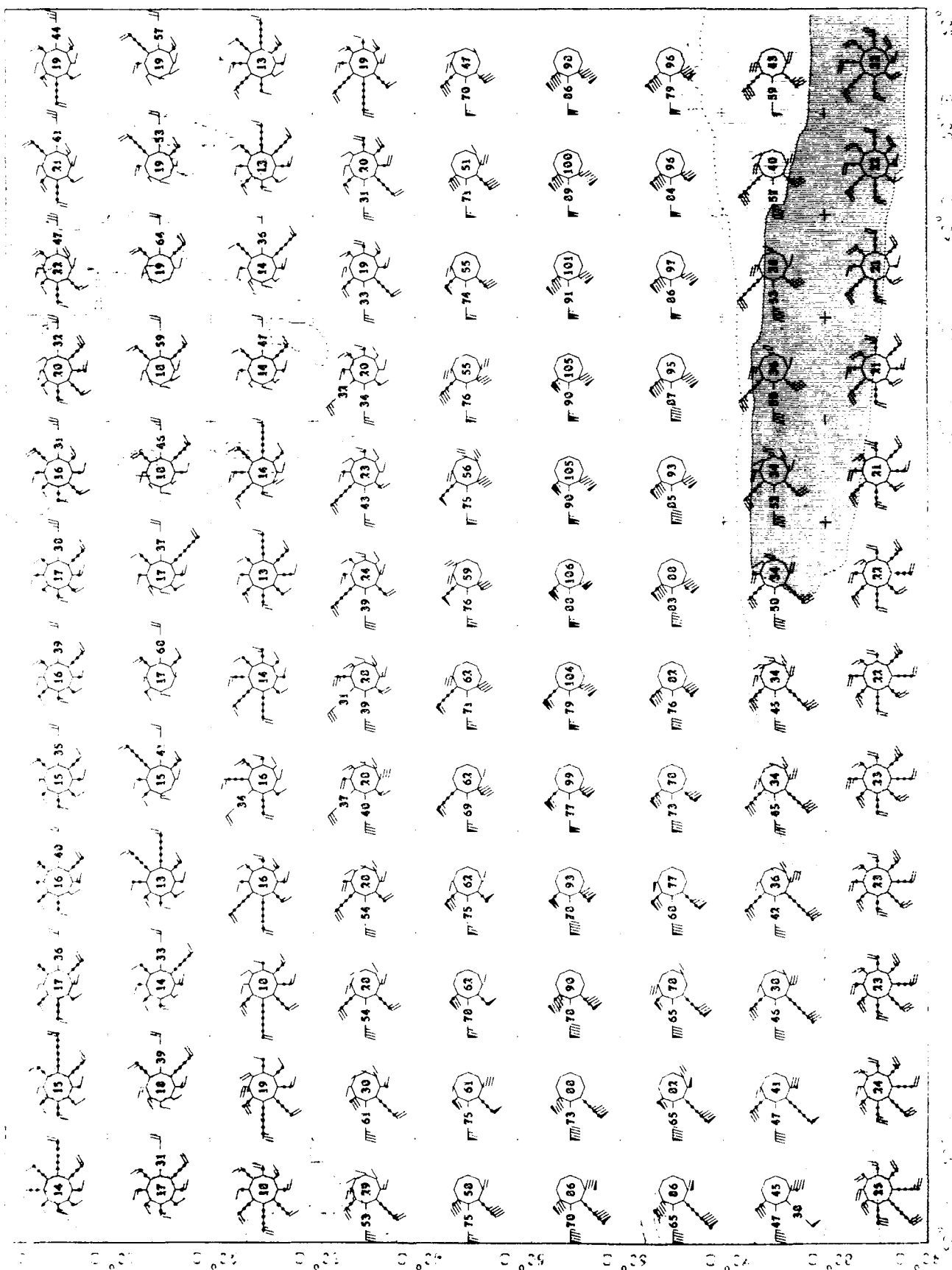


Upper Air Climatology
Southern Hemisphere

10000 200 5000
70 MB

October
70 MB





Upper Air Climatology
Southern Hemisphere

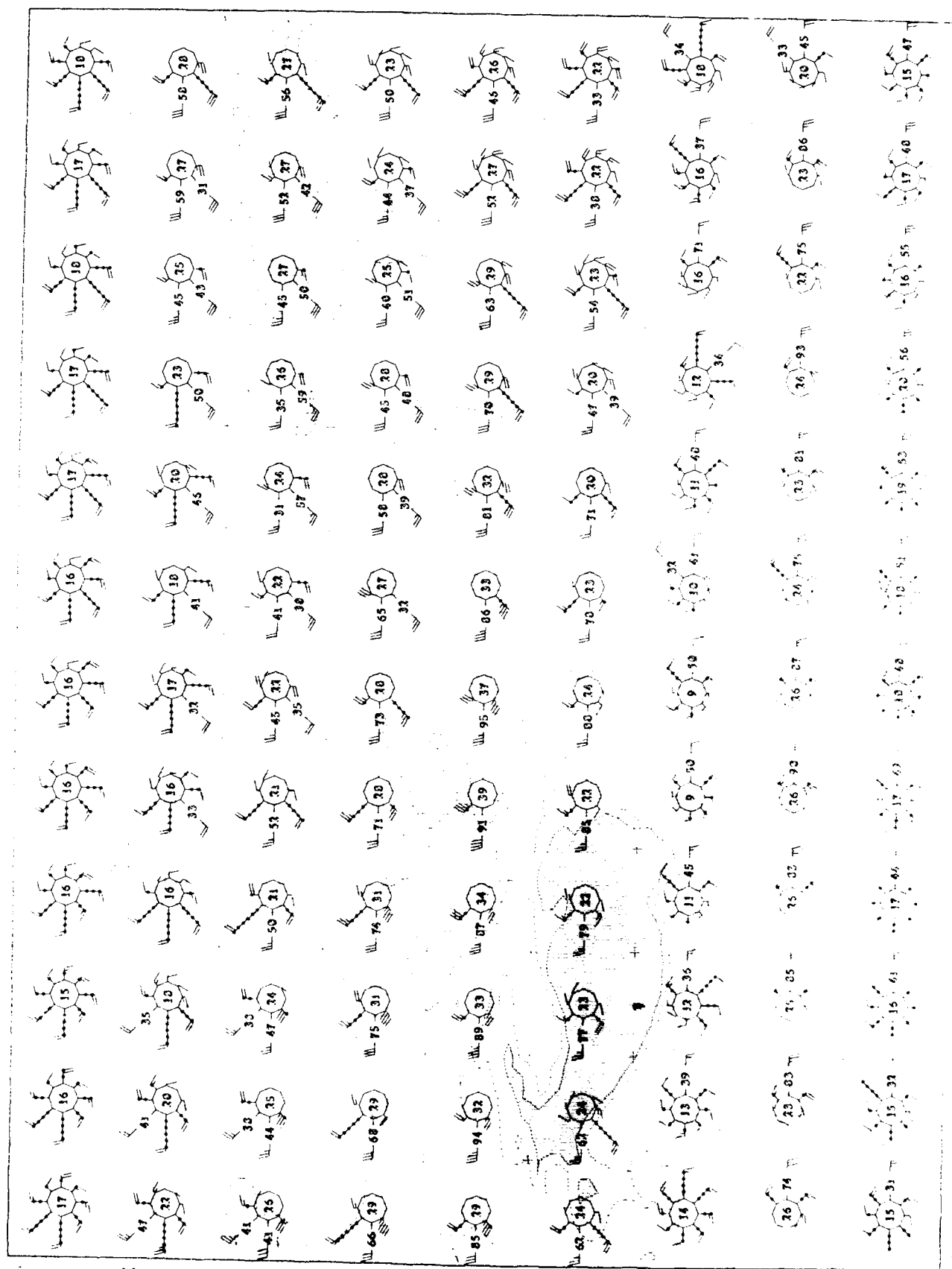
50 MB
50 MB

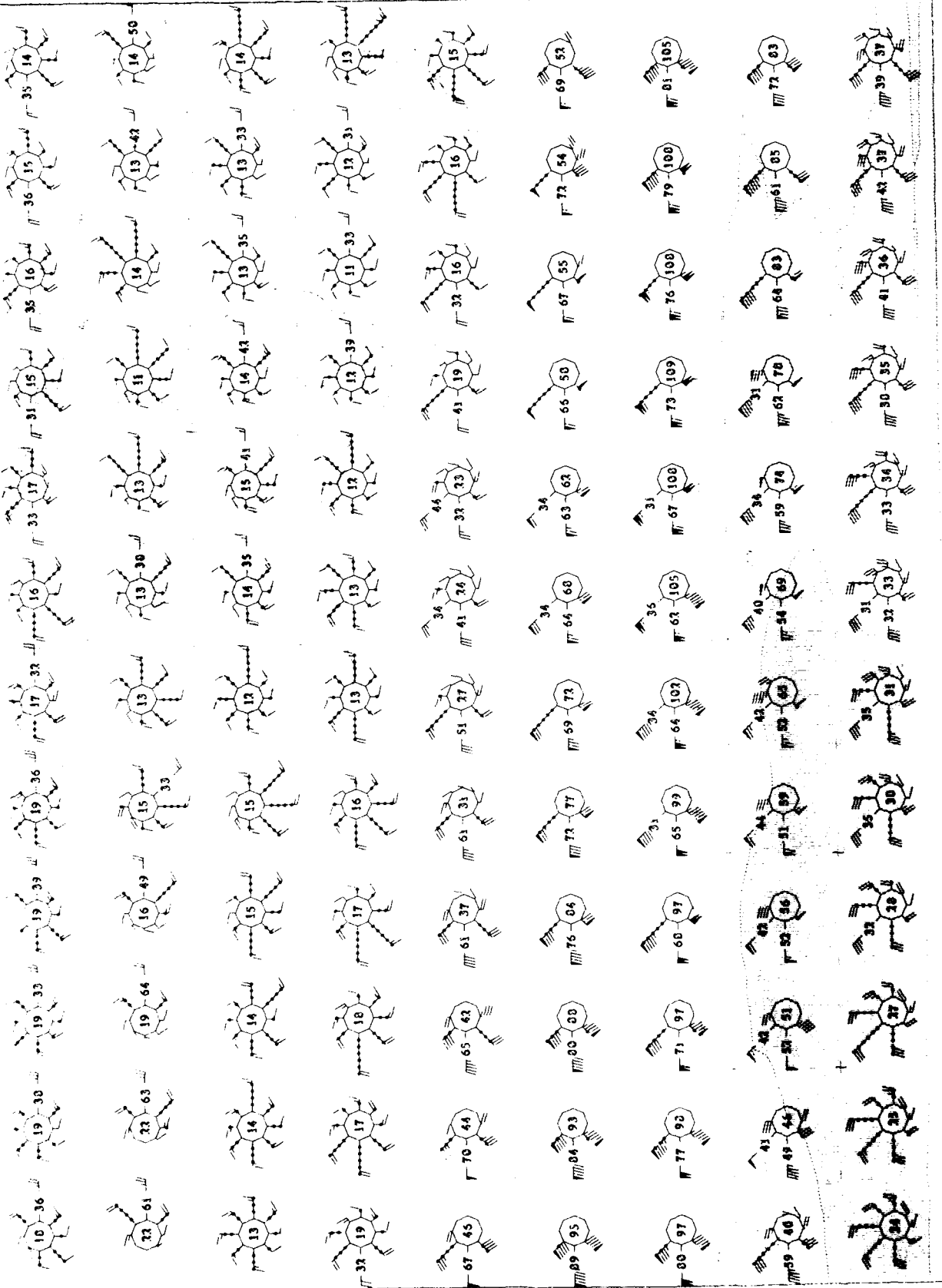
October
50 MB

Upper and Lower
Northern Hemisphere

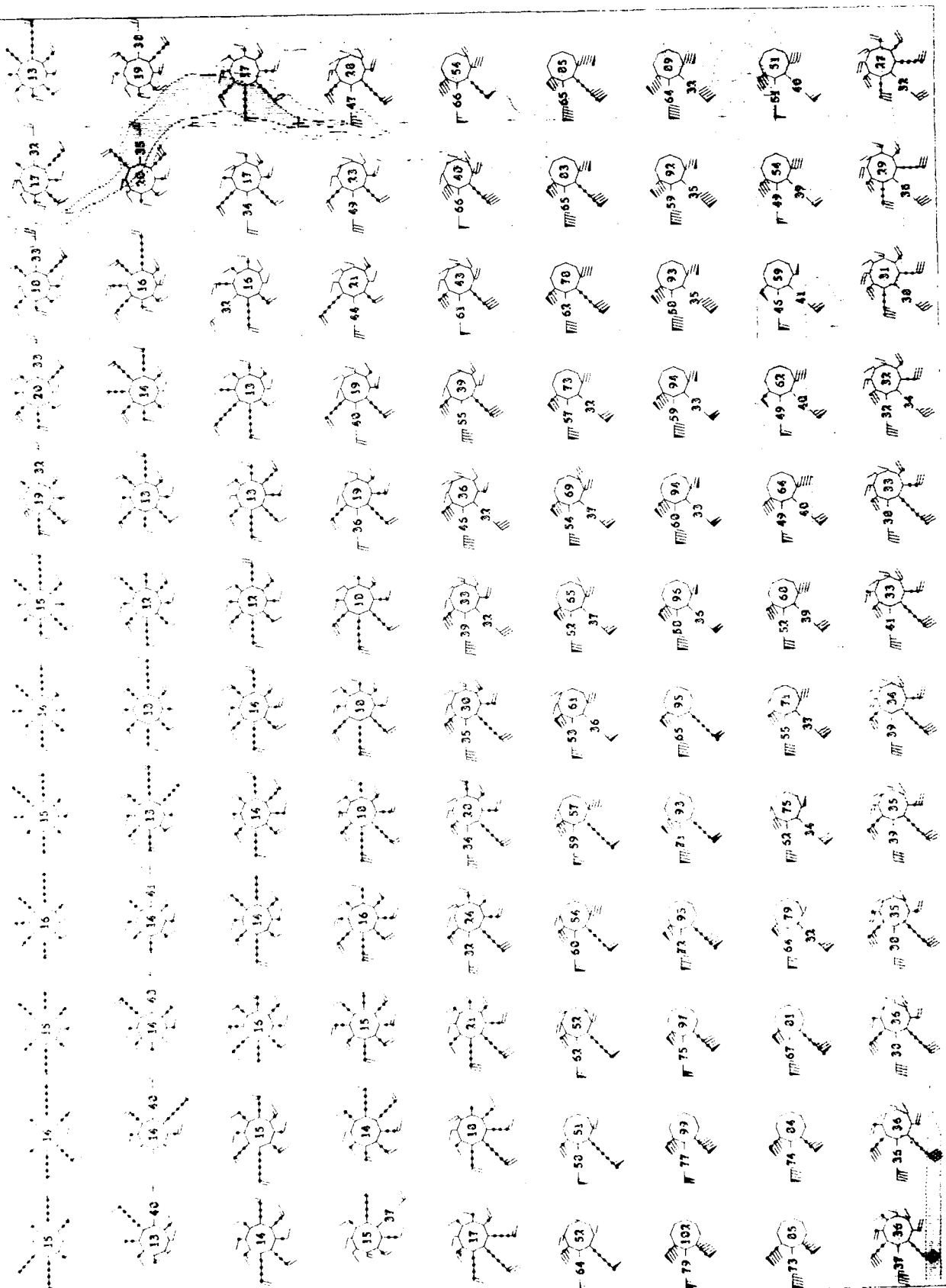
1950-1959
1960-1969

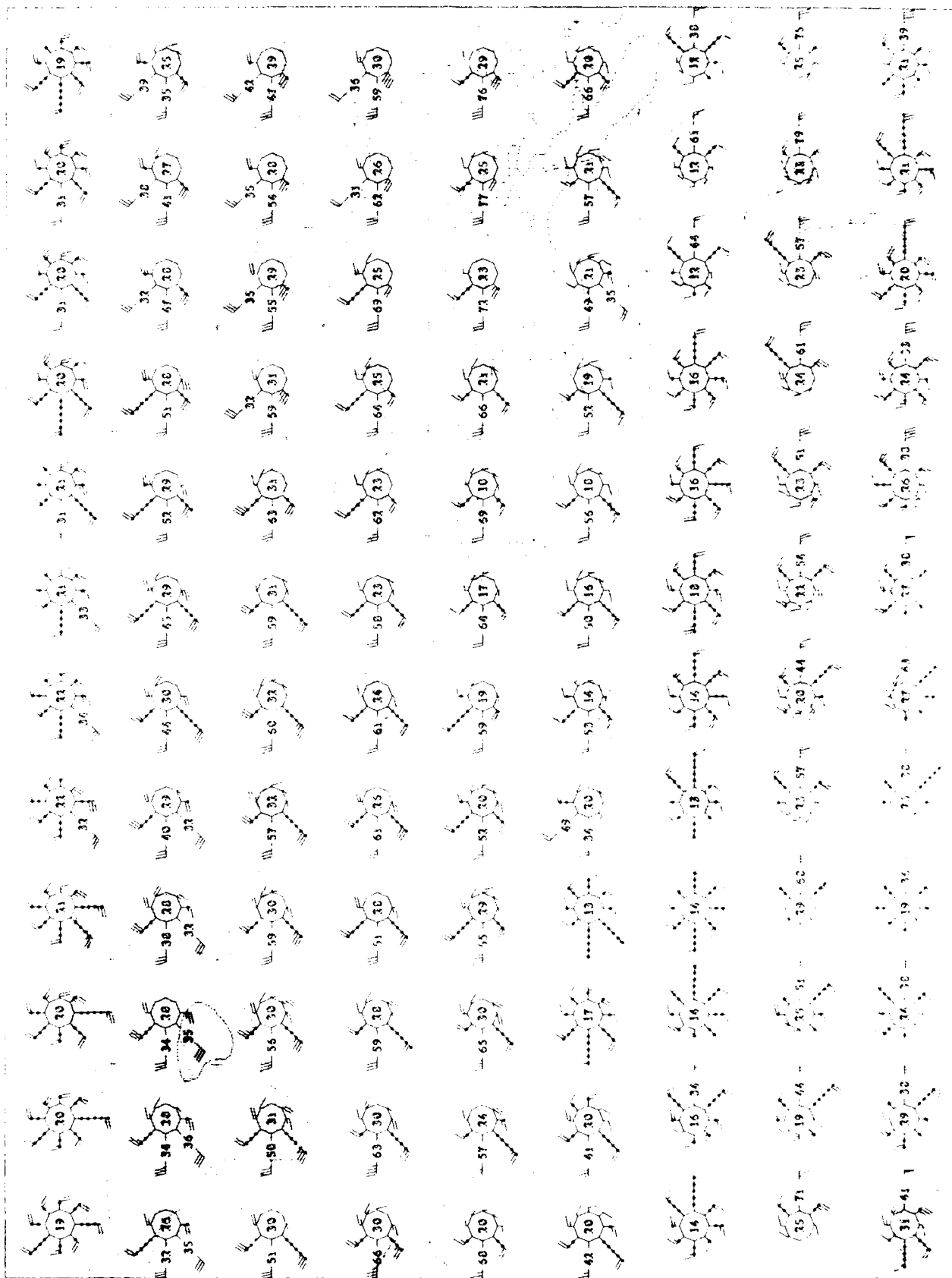
1970-1979
1980-1989

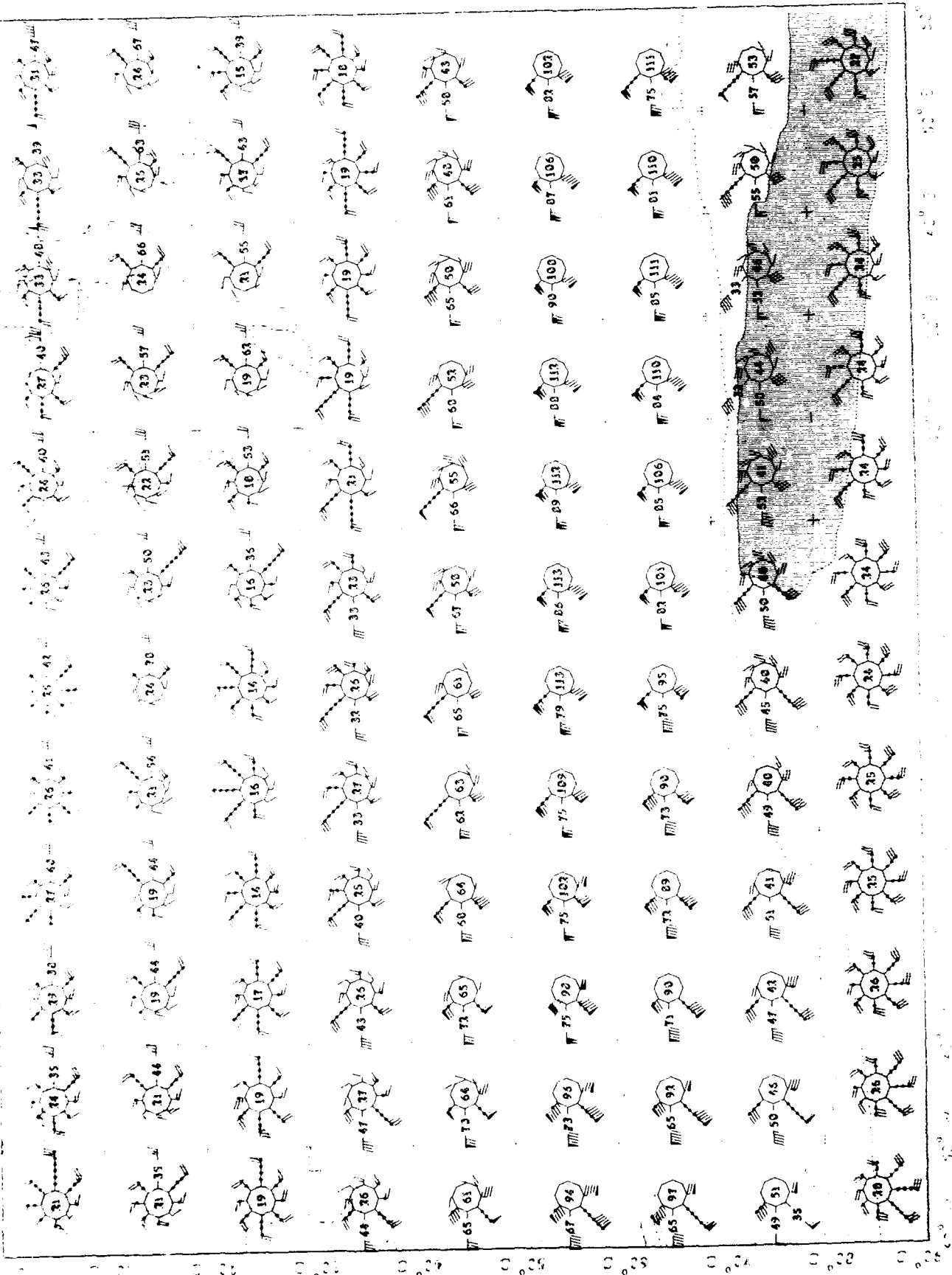


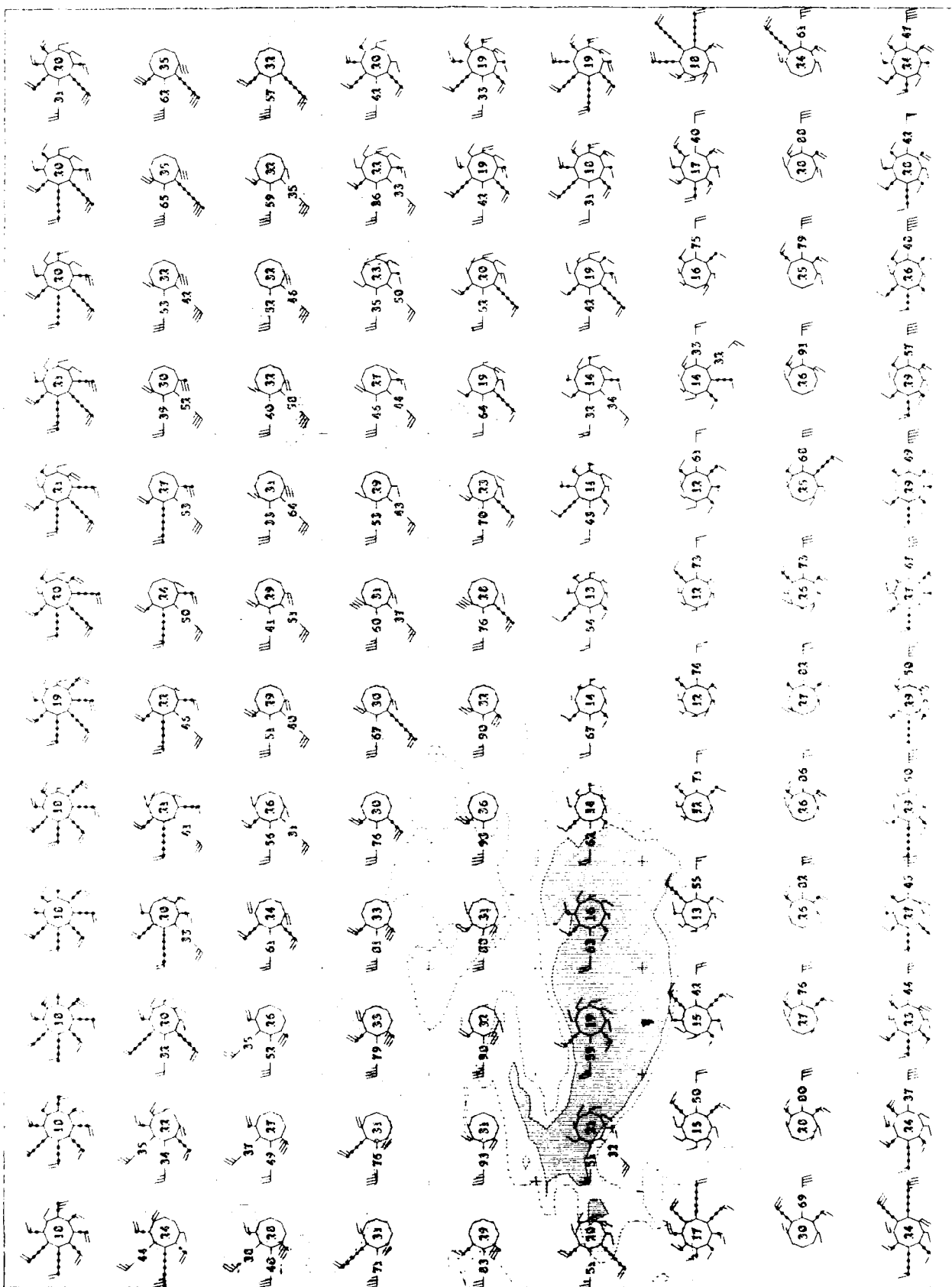


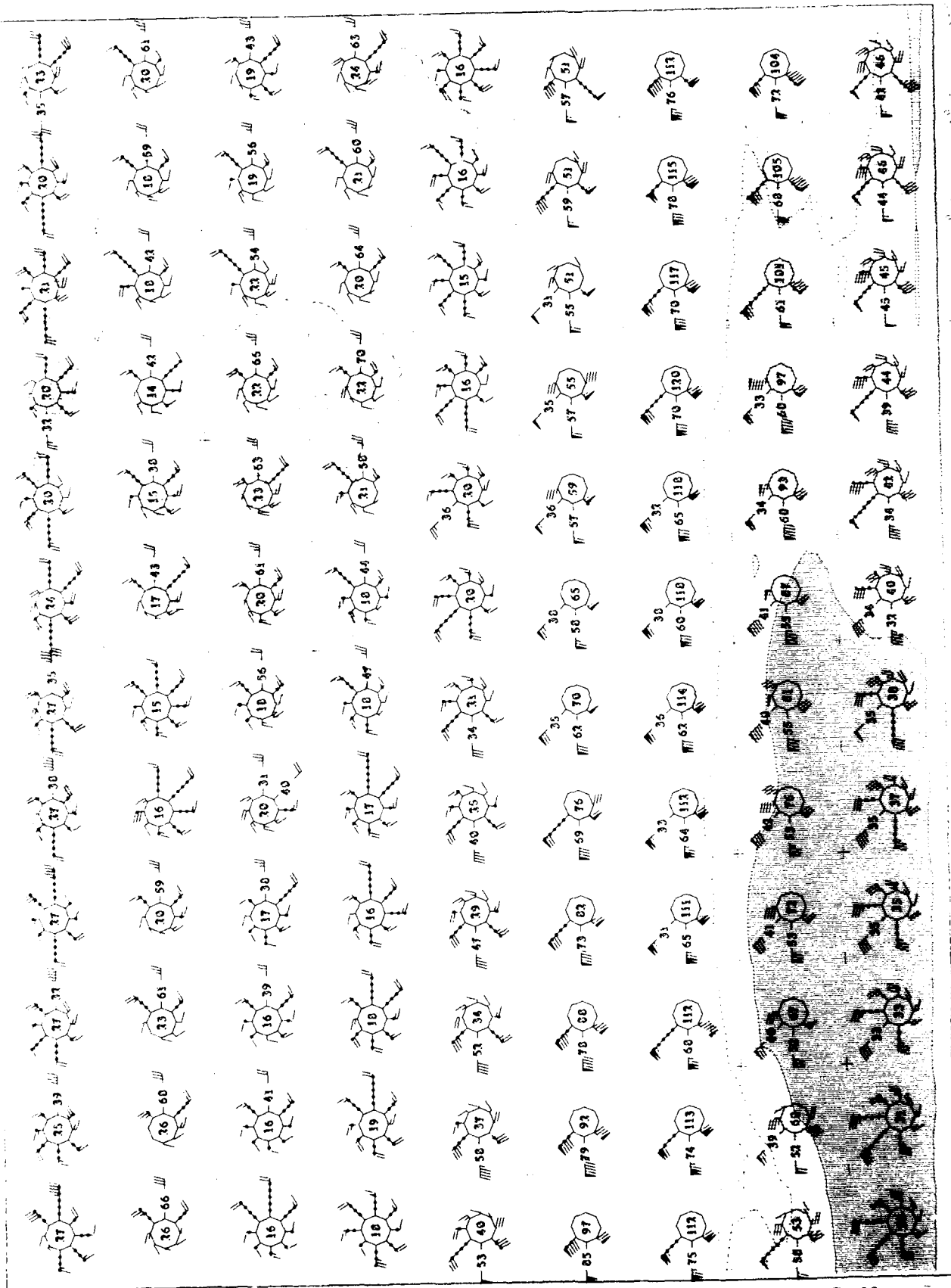








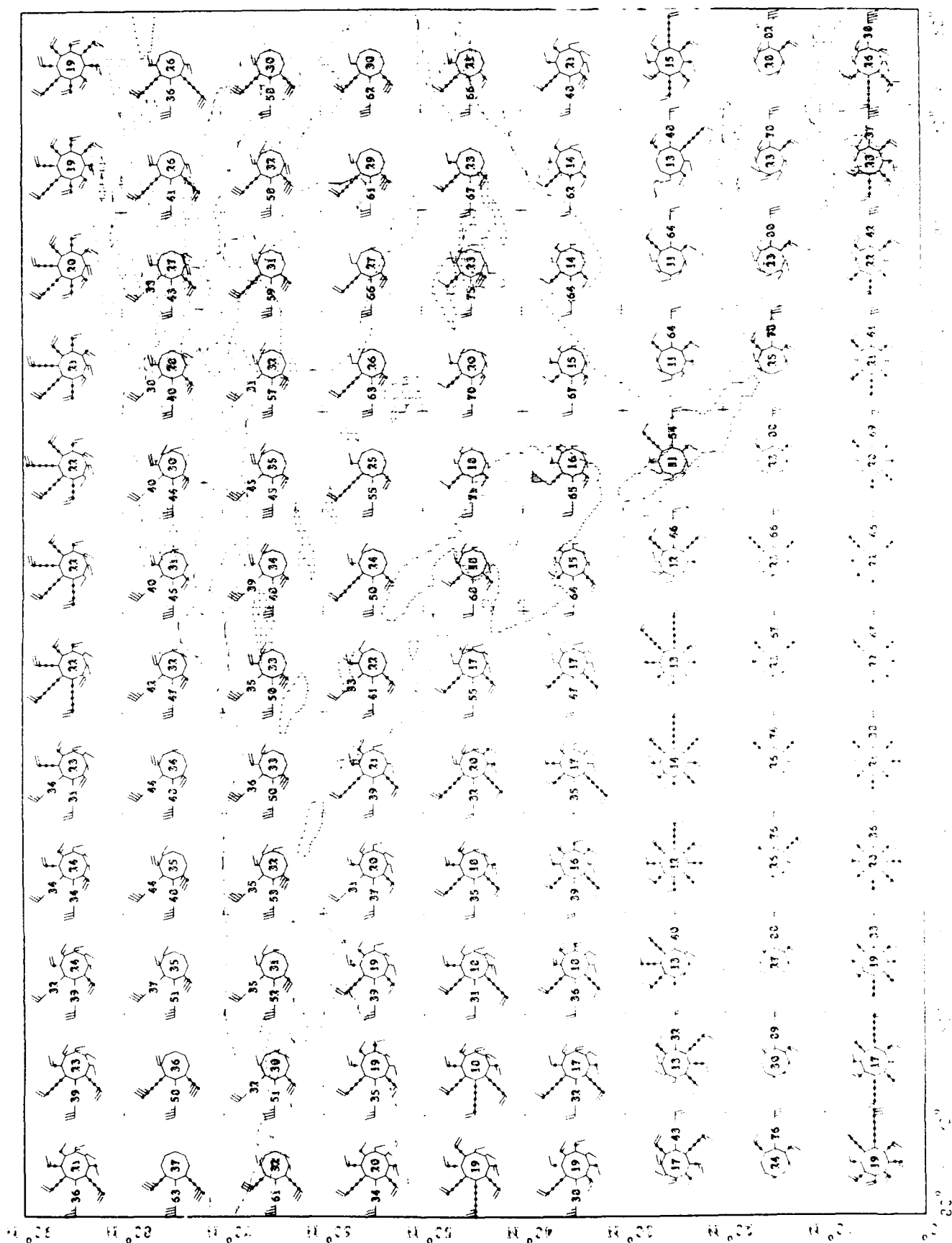


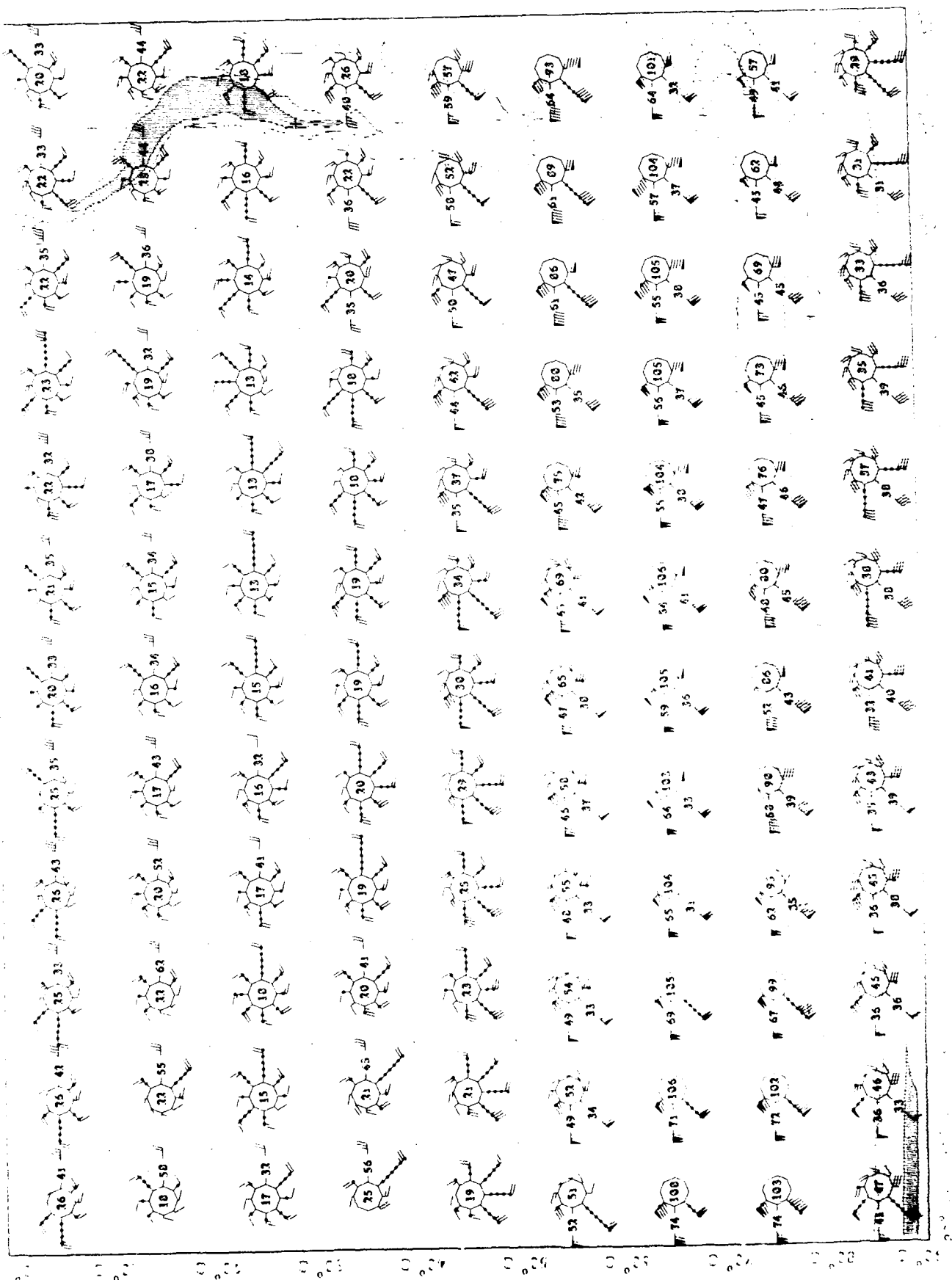


Upper Air Climatology
Southern Hemisphere

October 10 1966
10:00 AM

October
30 MIB





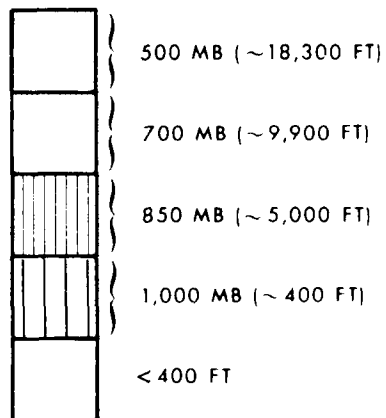
Upper Ant. Chimerology
Southern Hemisphere

October
20 1915

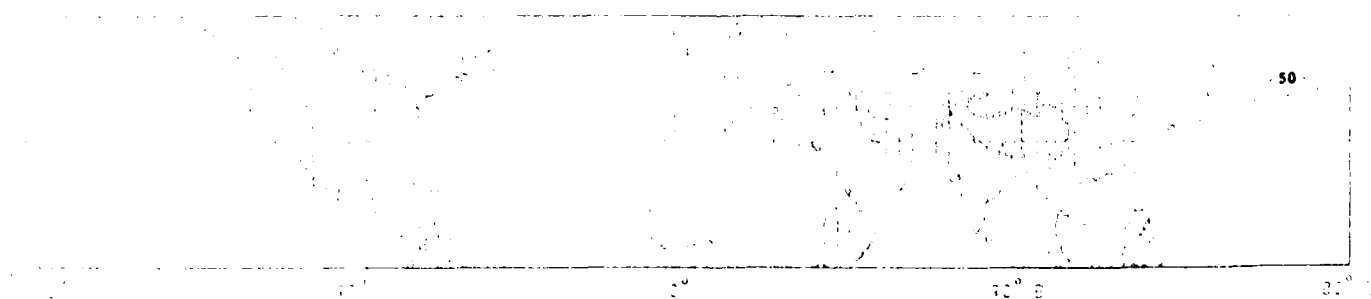
JET STREAM
(10 LEVELS, 500 TO 30 MB)

- Contours of mean scalar wind speed in knots
- Minimum mean scalar speed: 50 knots
- Contour interval of mean scalar speed: 25 knots

ELEVATION SCALE

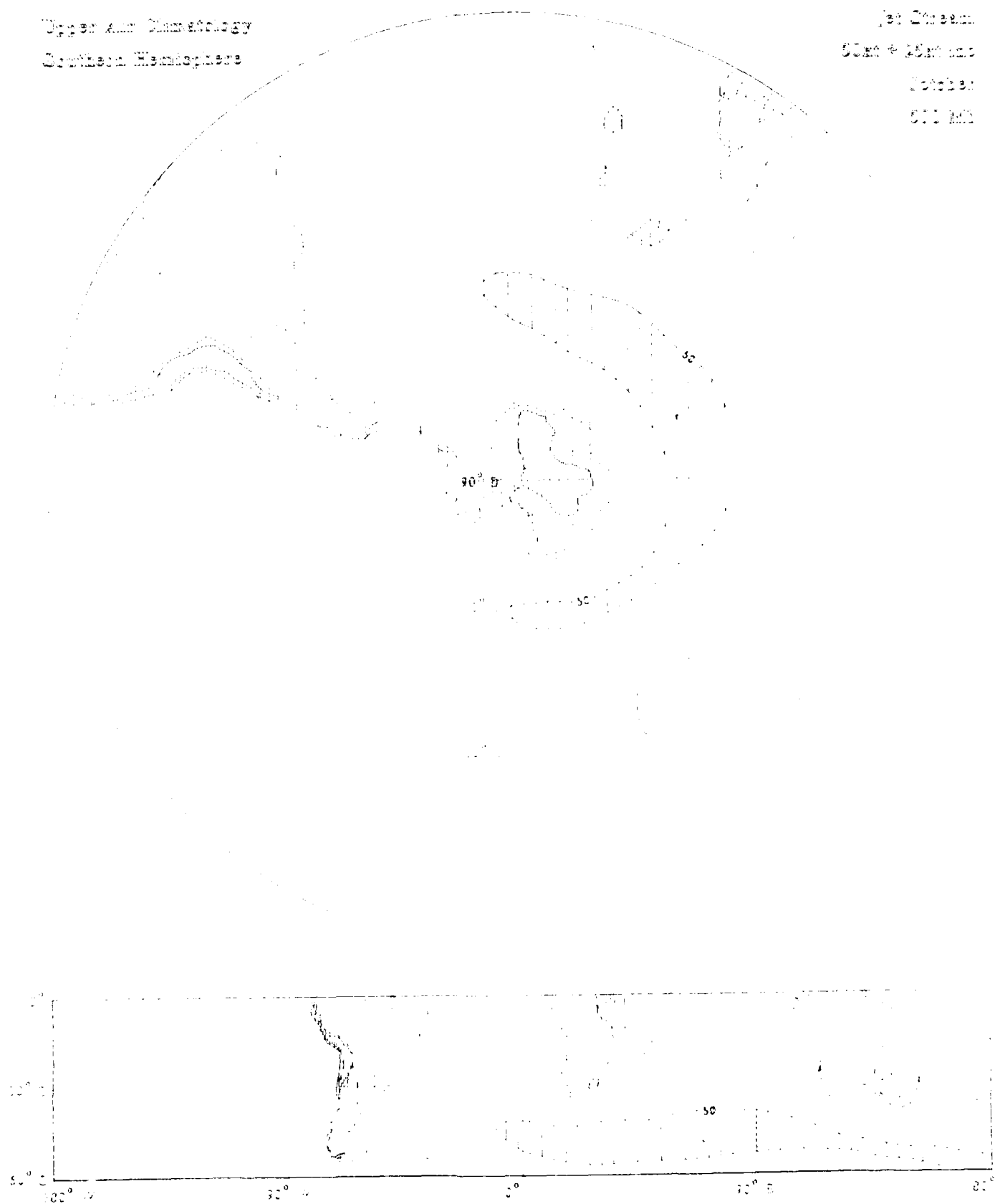


Upper And Cimmerian
Northern Hemisphere



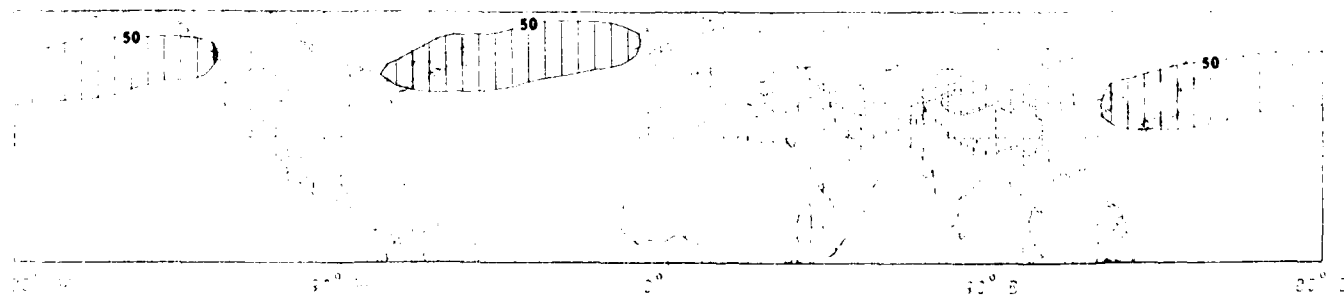
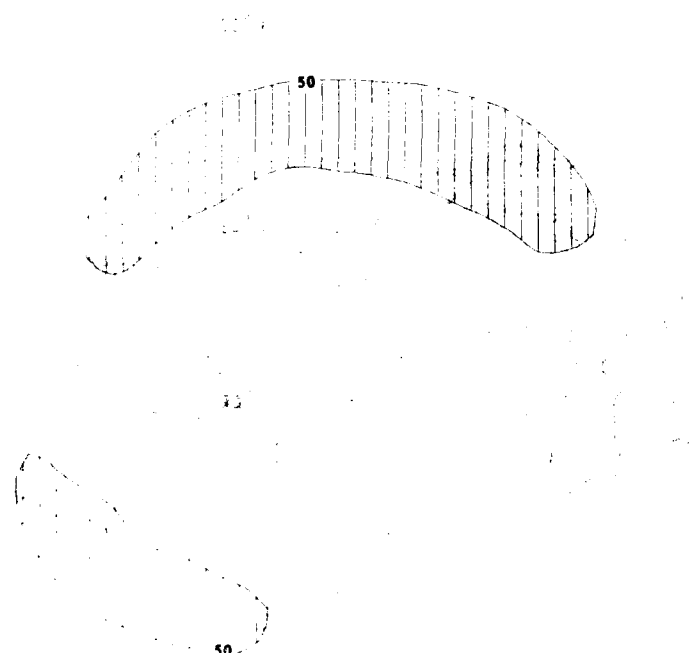
Upper Air Climatology
Southern Hemisphere

Jet Stream
500m + 1000mb
October
500 mb



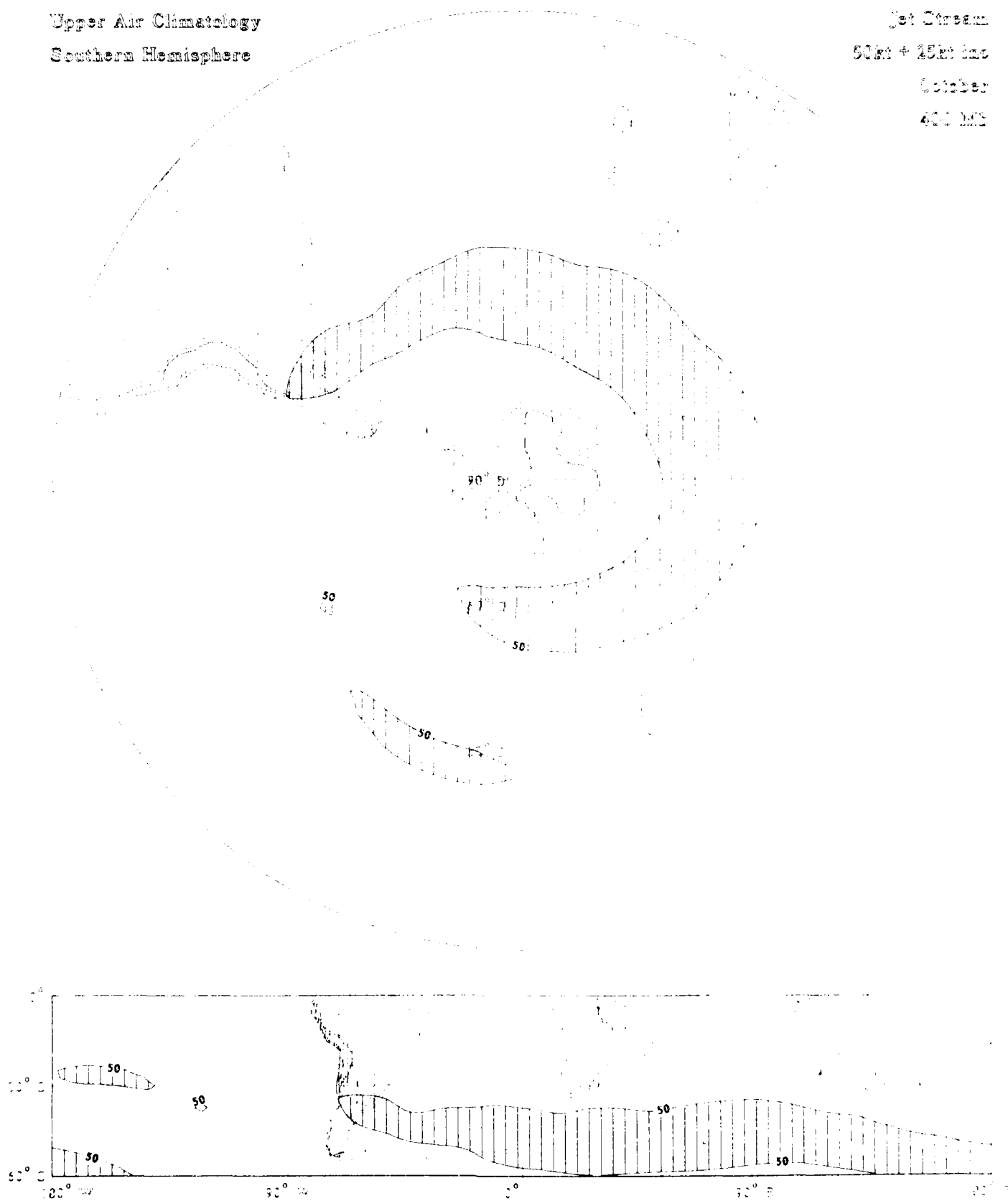
Jet Stream
50kt + 25kt line
October
400 MB

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 25kt cap
October
400 mb



Jet Stream

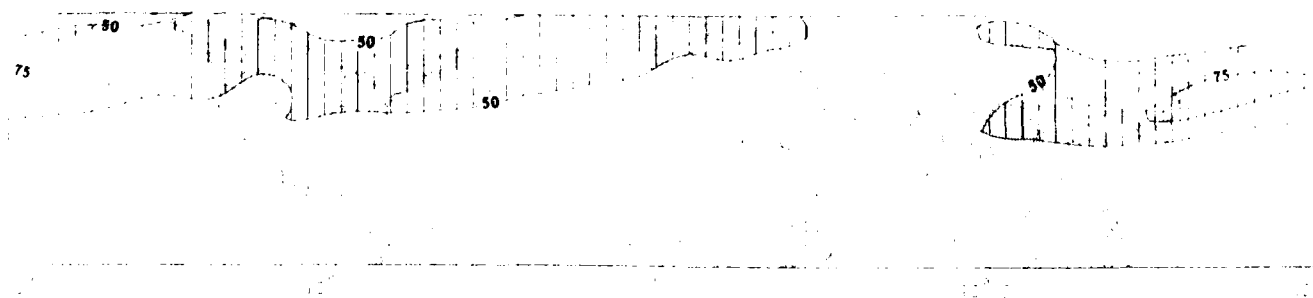
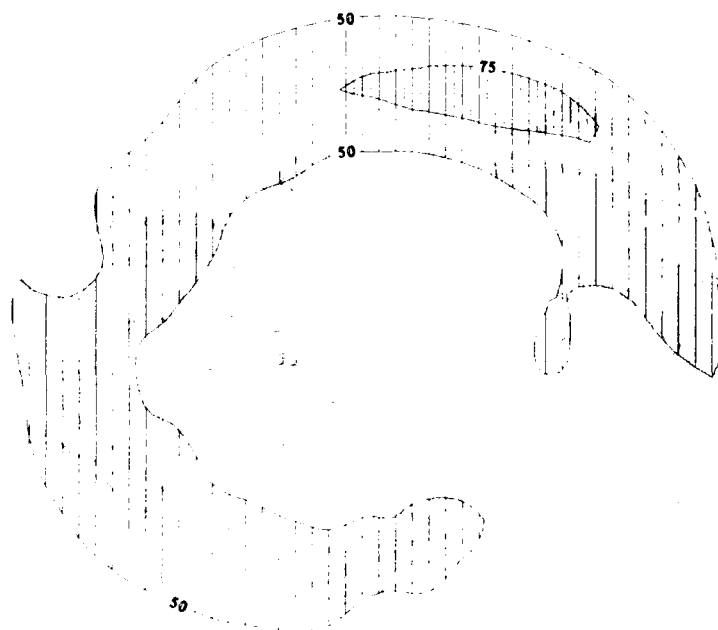
50kt + 25kt and

October

500 mb

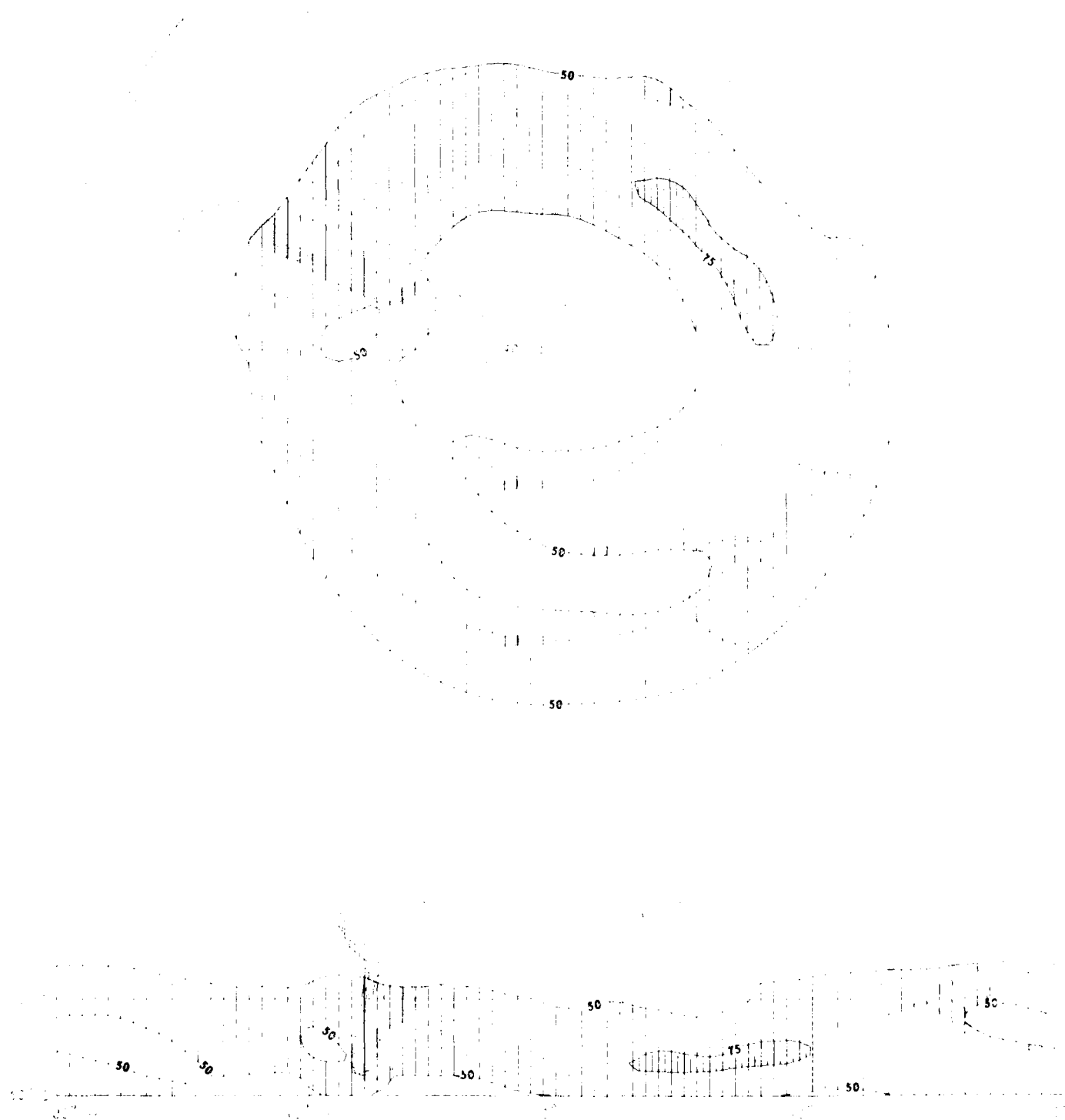
Upper Air Climatology

Northern Hemisphere



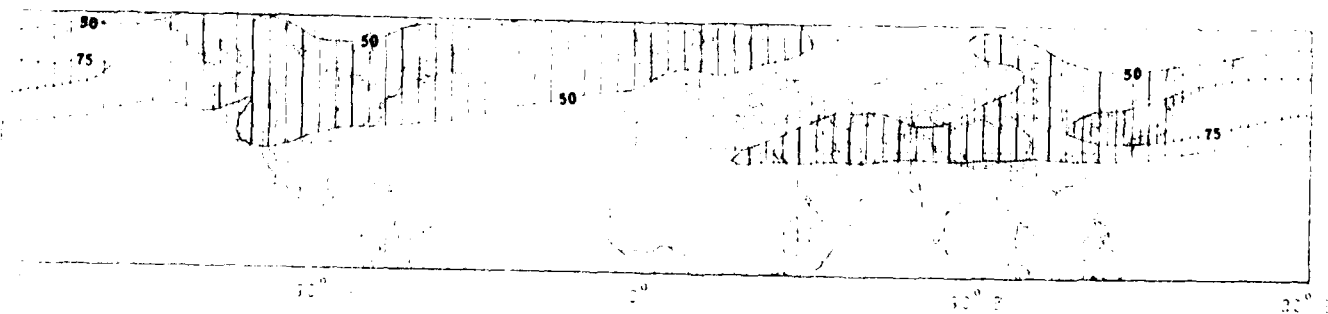
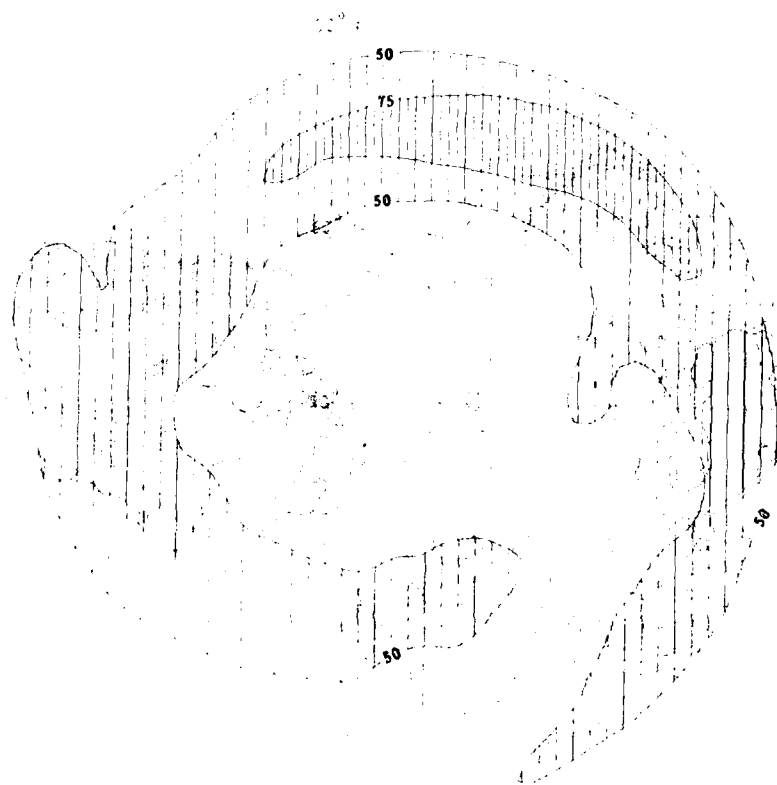
Upper Air Climatology
Southern Hemisphere

Net Stream
50kt + 10kt and
above
1951-1952



Jet Stream
 50kt + 10kt line
 October
 250 MB

Upper Air Climatology
 Northern Hemisphere



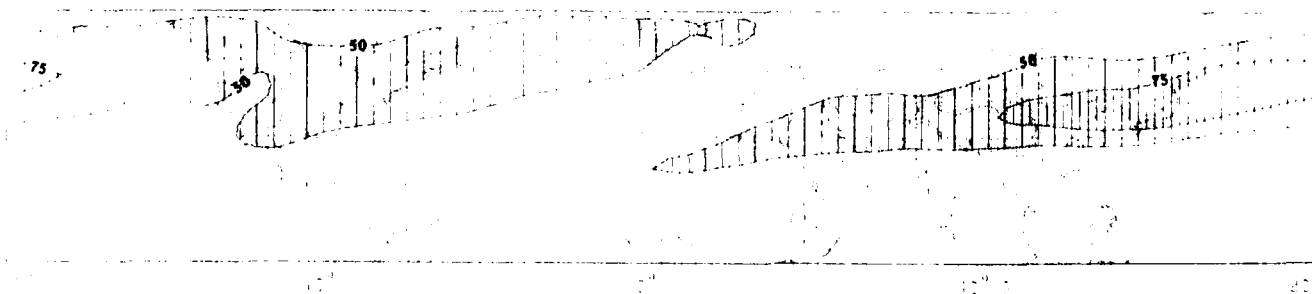
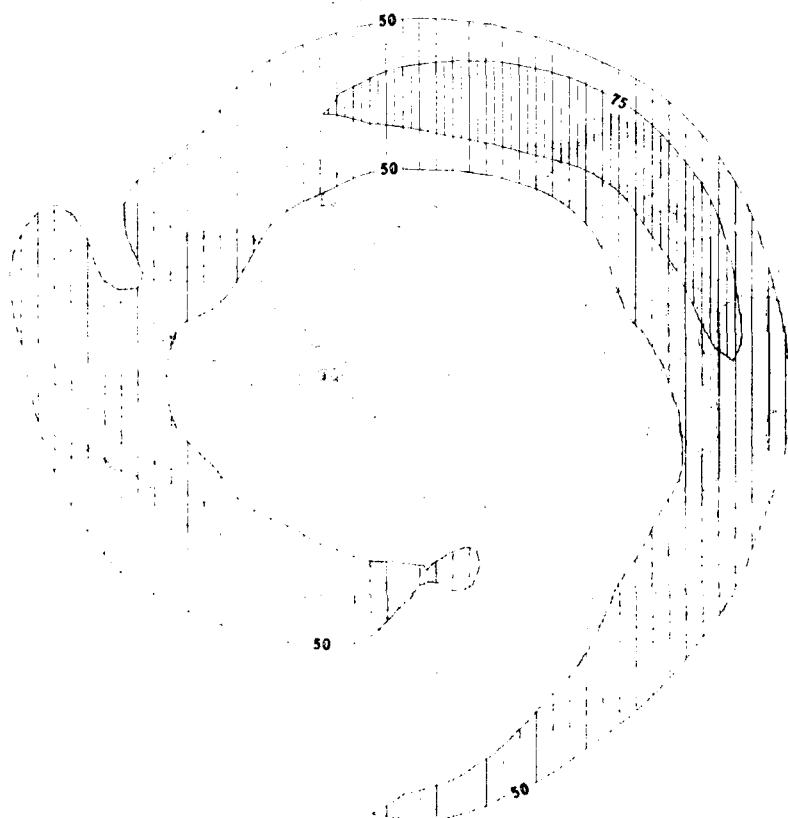
Types and Climatology
Central Hemisphere

(3) Ocean
SIR 1450000
October
1951



Jet Stream
Chart # 5547 and
October
1951

Upper Air Climatology
Northern Hemisphere



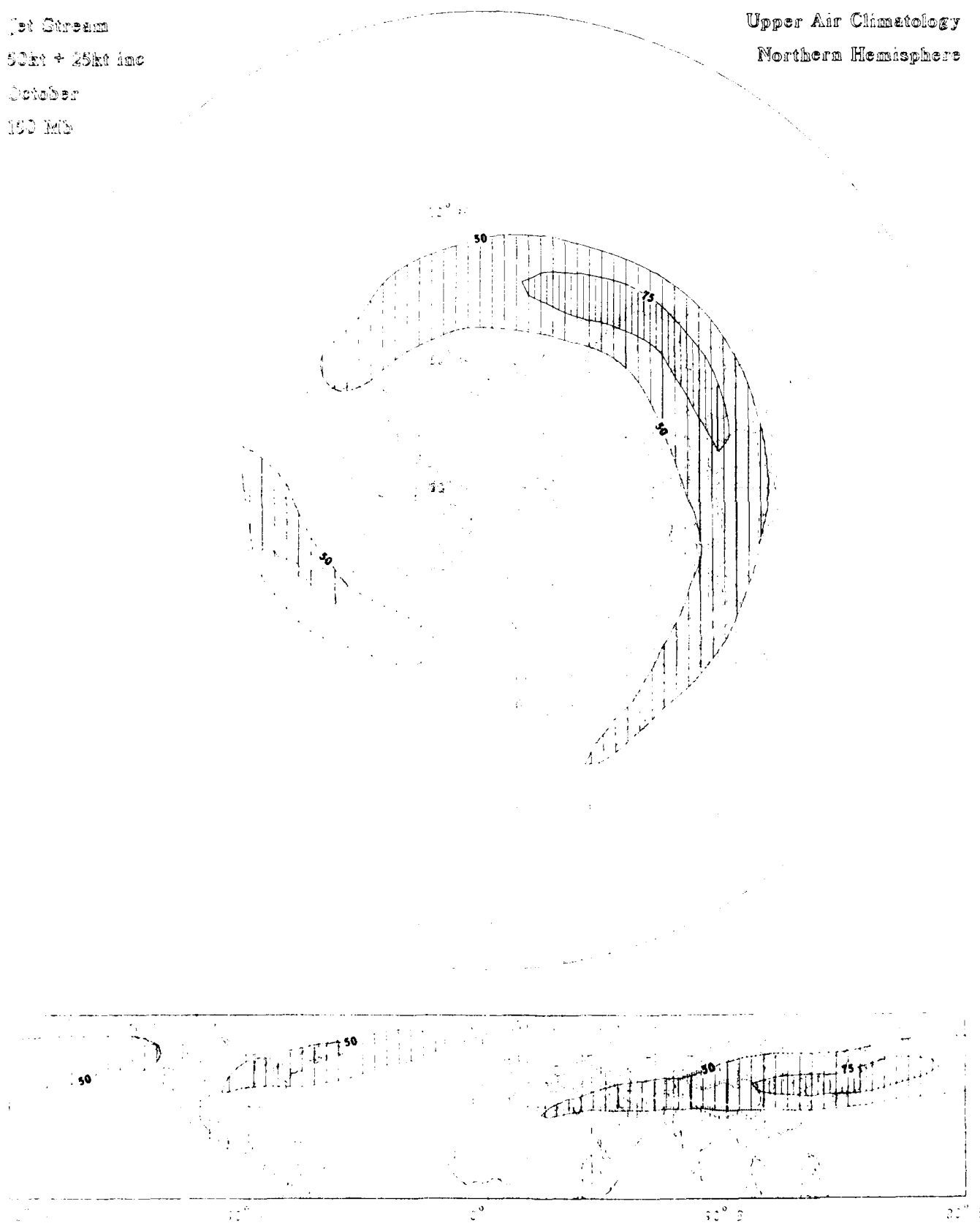
Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 20kt and
Colder
20°C and



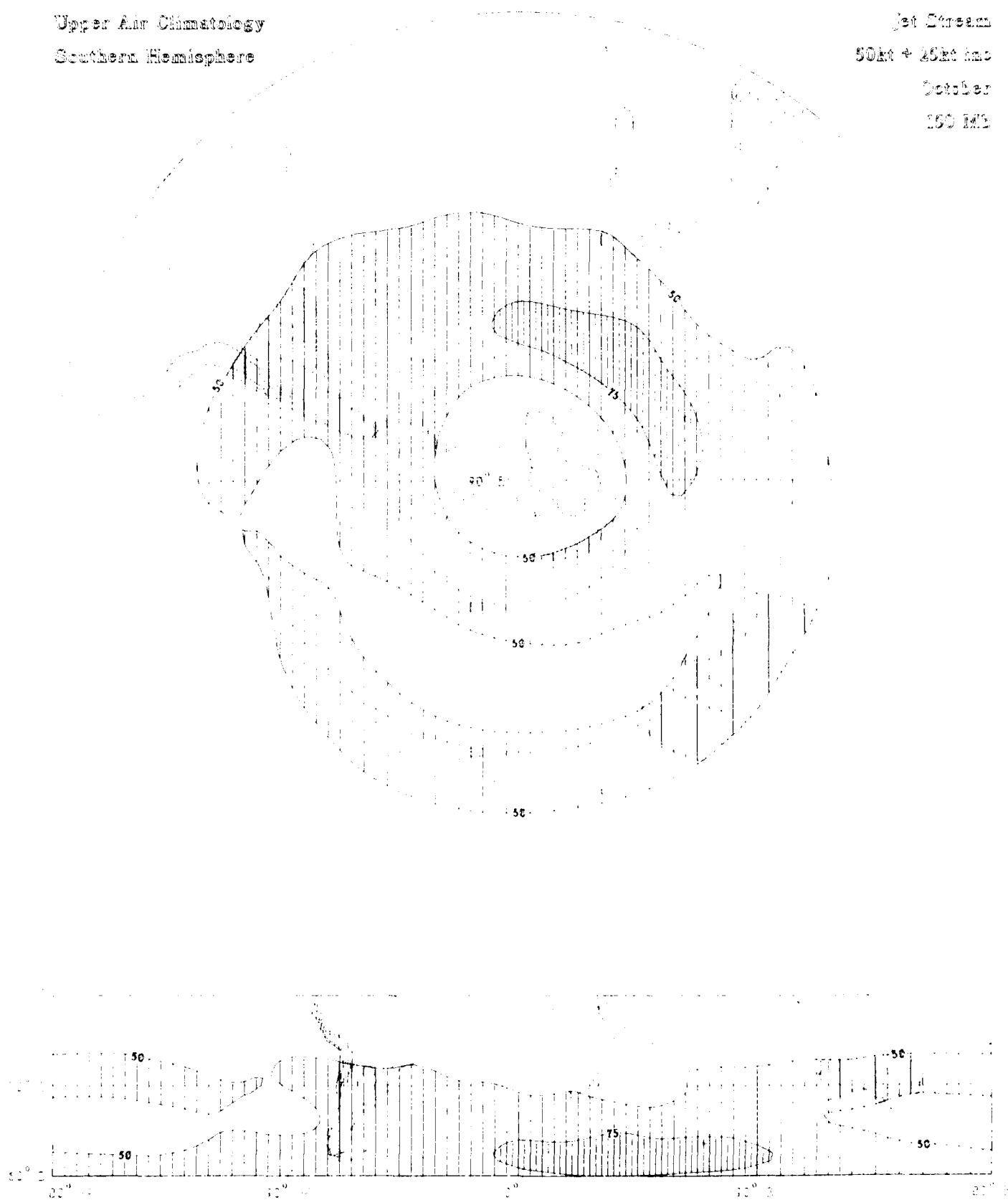
Jet Stream
50kt + 25kt inc
October
100 MB

Upper Air Climatology
Northern Hemisphere



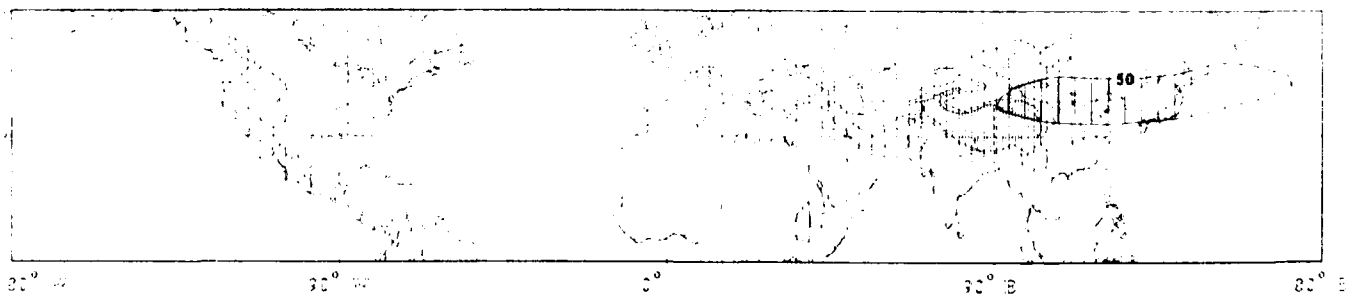
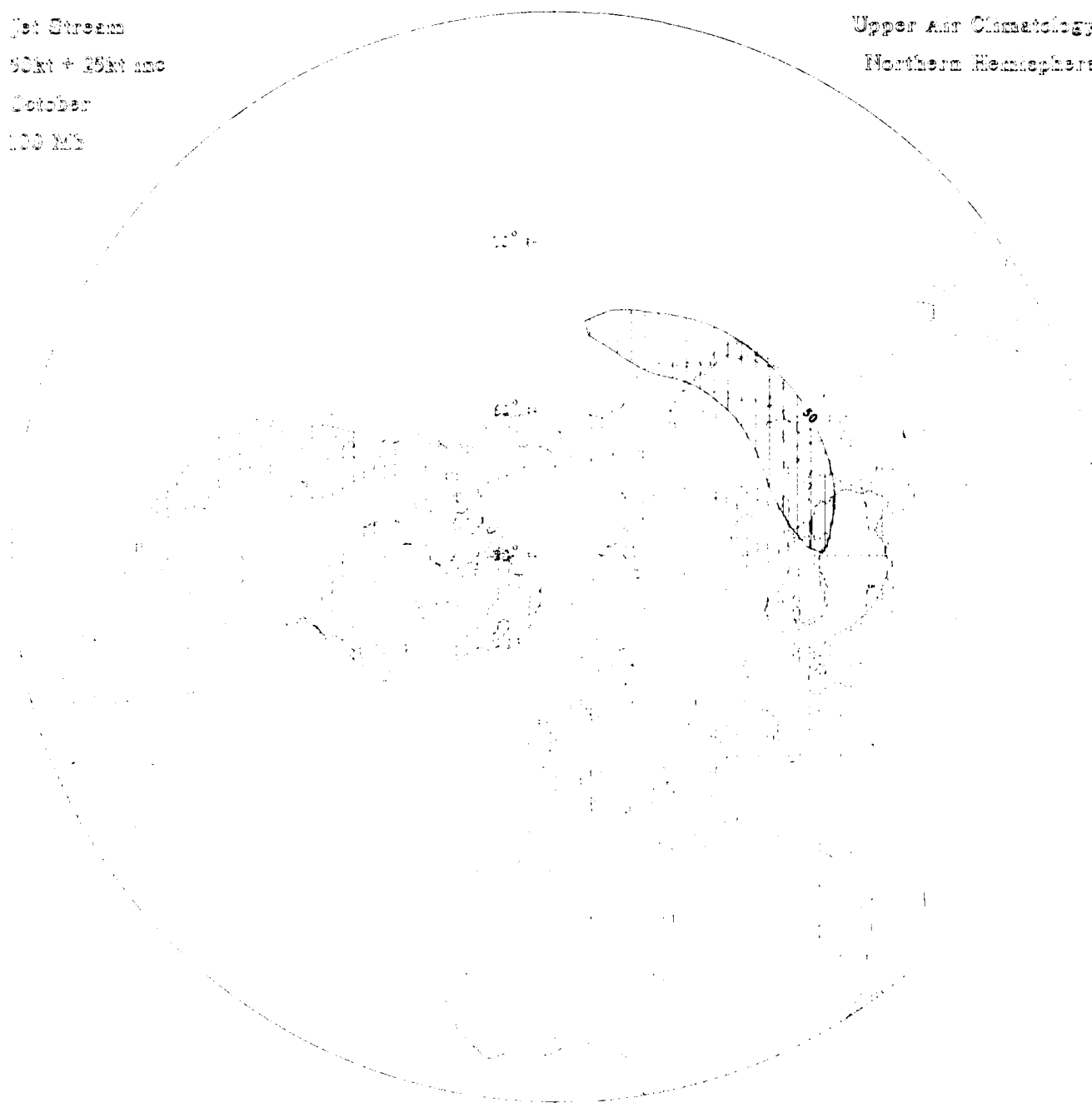
Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 25kt hmo
October
100 MB



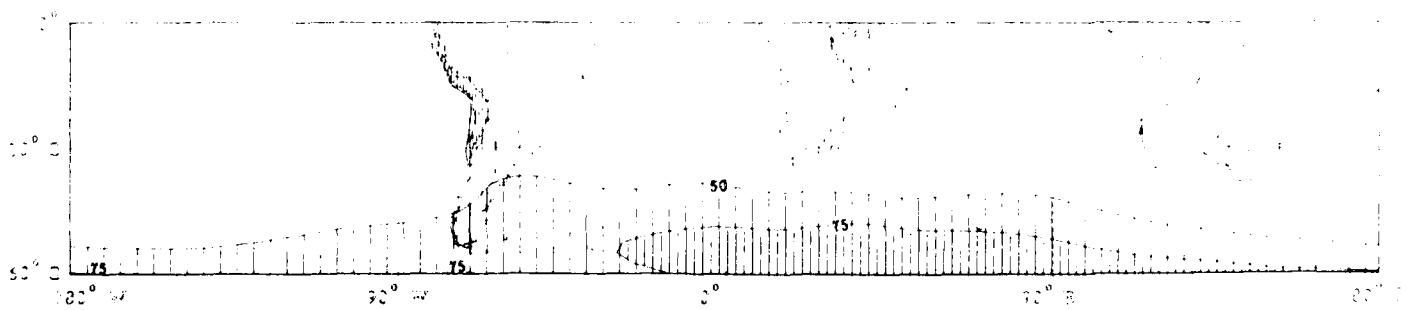
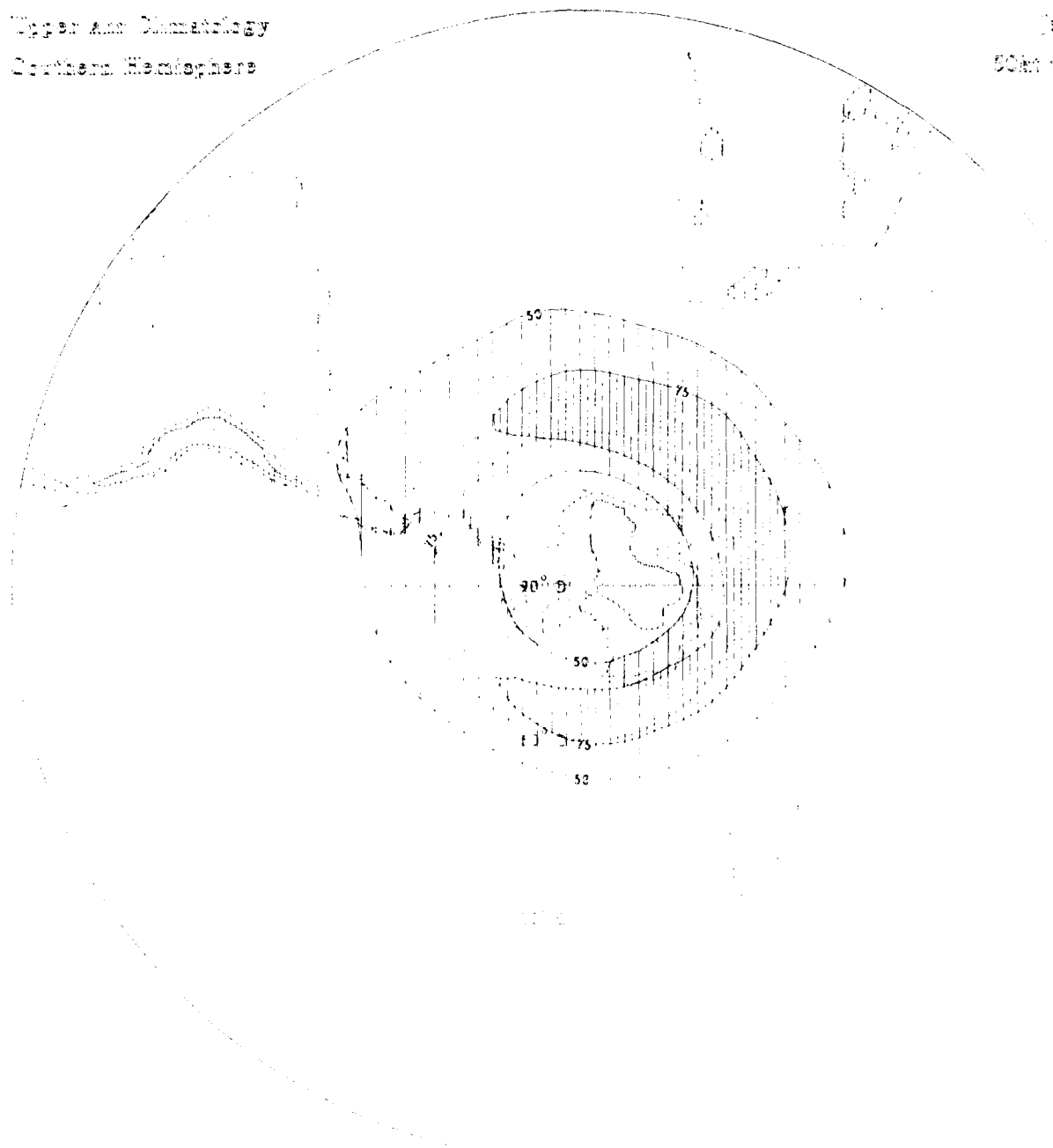
Jet Stream
50kt + 25kt and
October
100 MB

Upper Air Climatology
Northern Hemisphere



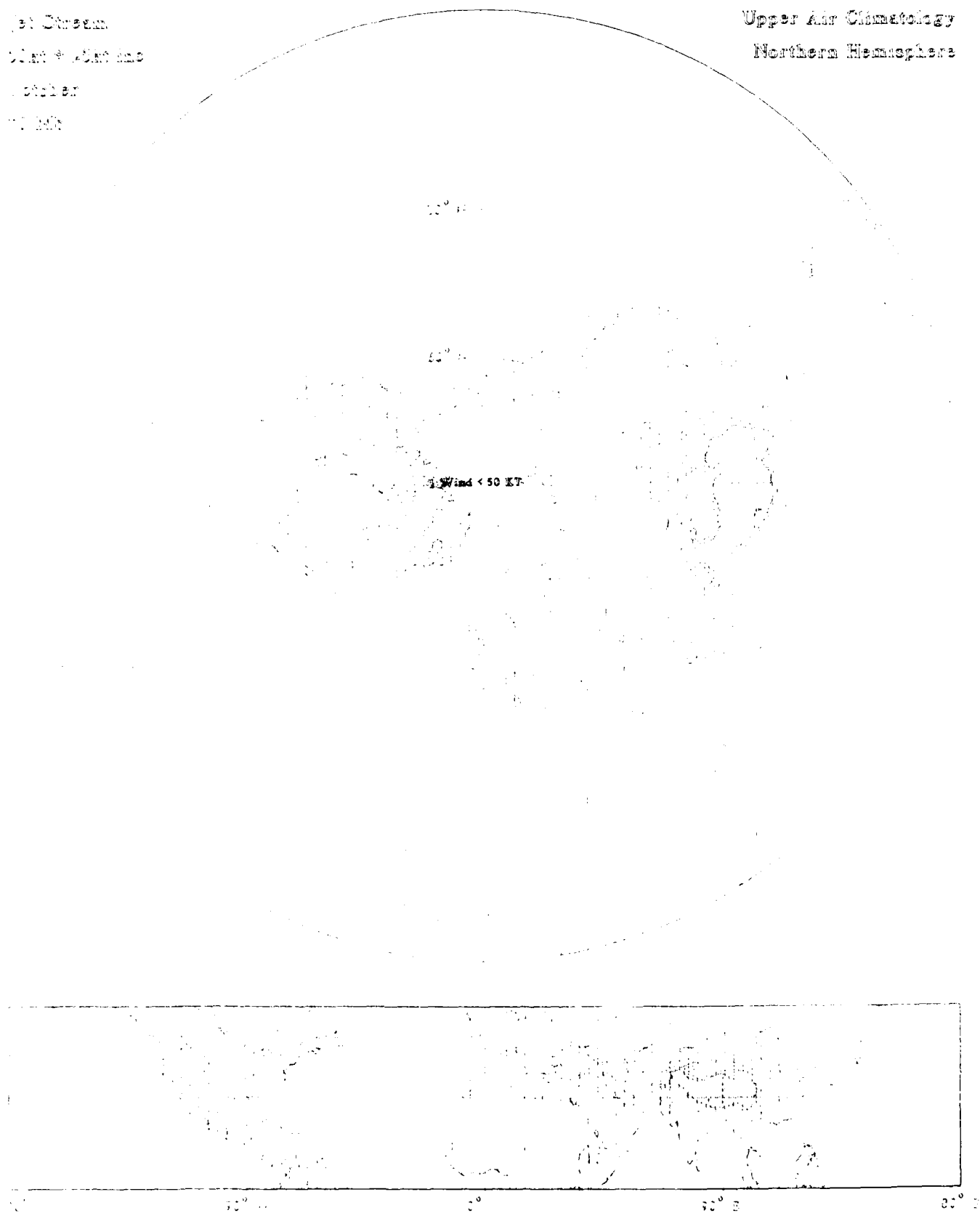
Upper Air Climatology
Northern Hemisphere

Jet Stream
50km + 10km
10km
20km



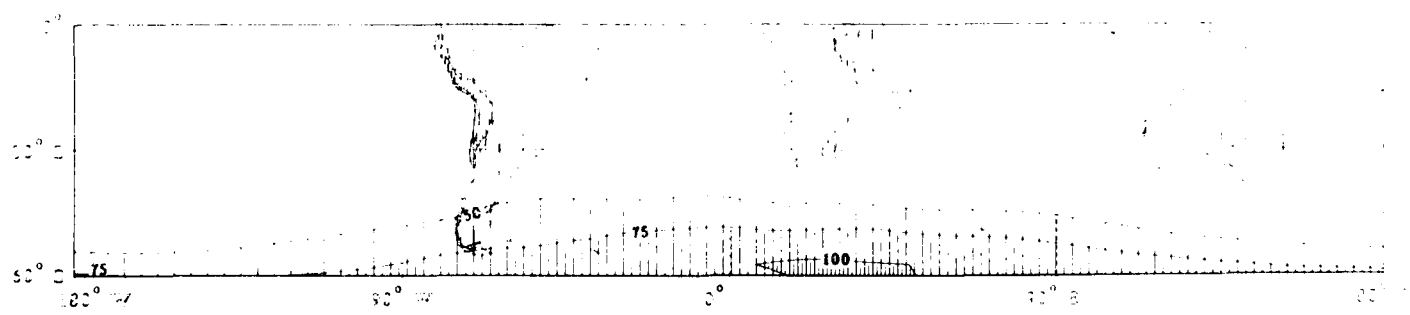
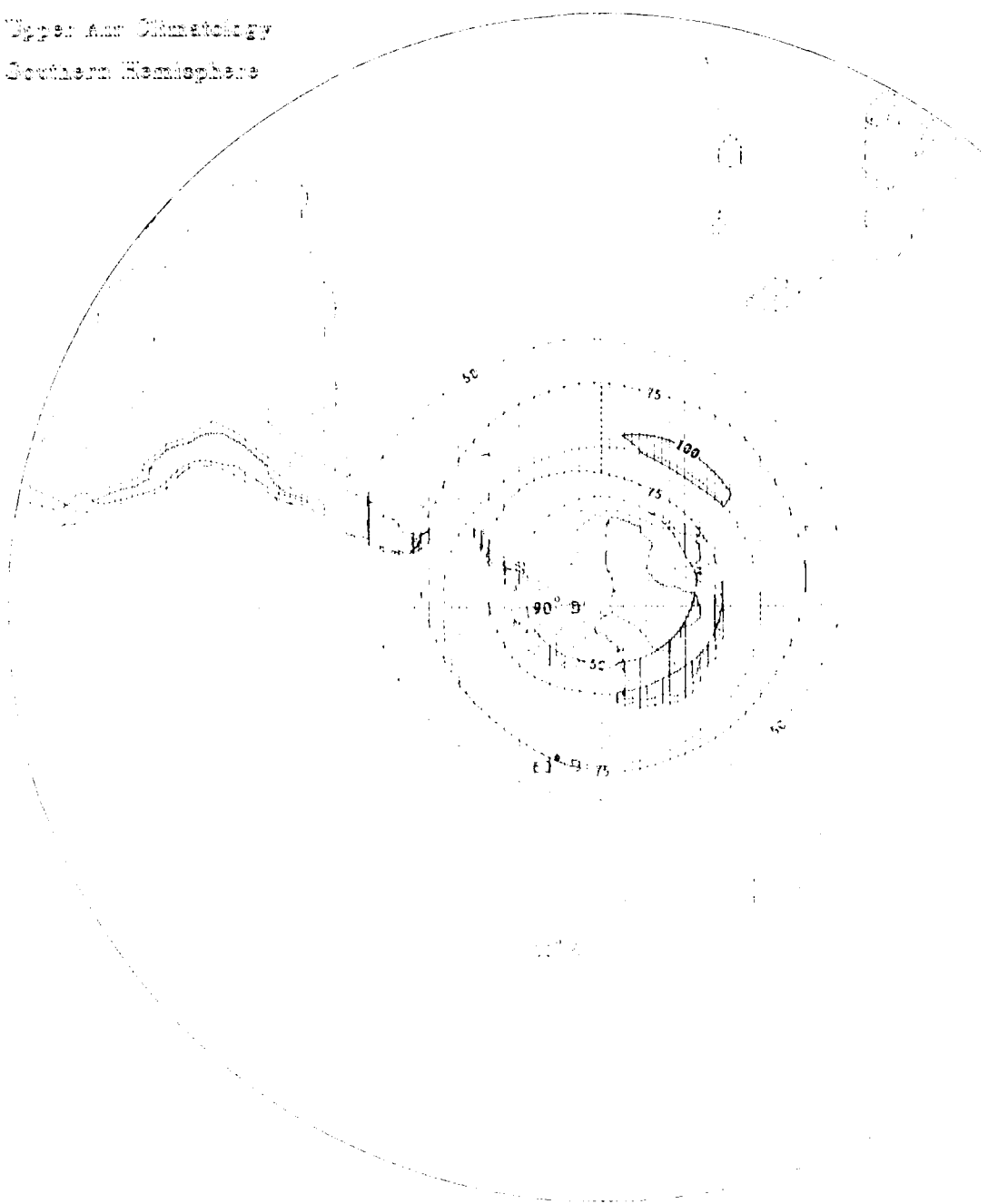
Jet Stream
Wind + Air Mass
Pressure
Clouds

Upper Air Climatology
Northern Hemisphere



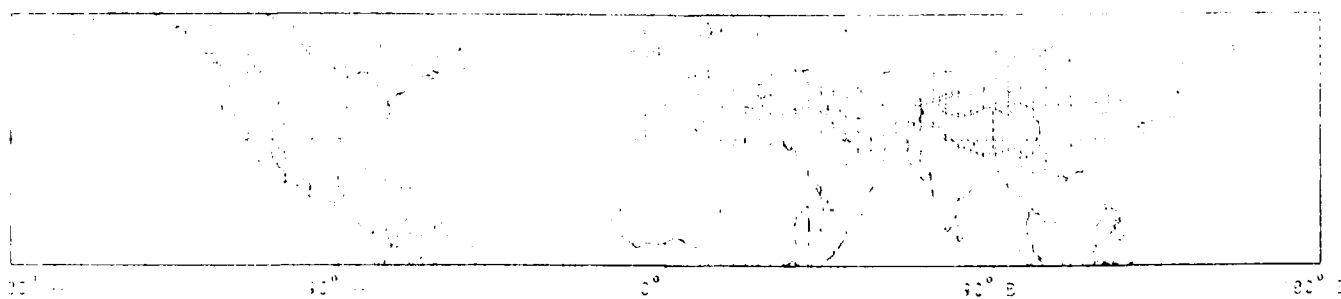
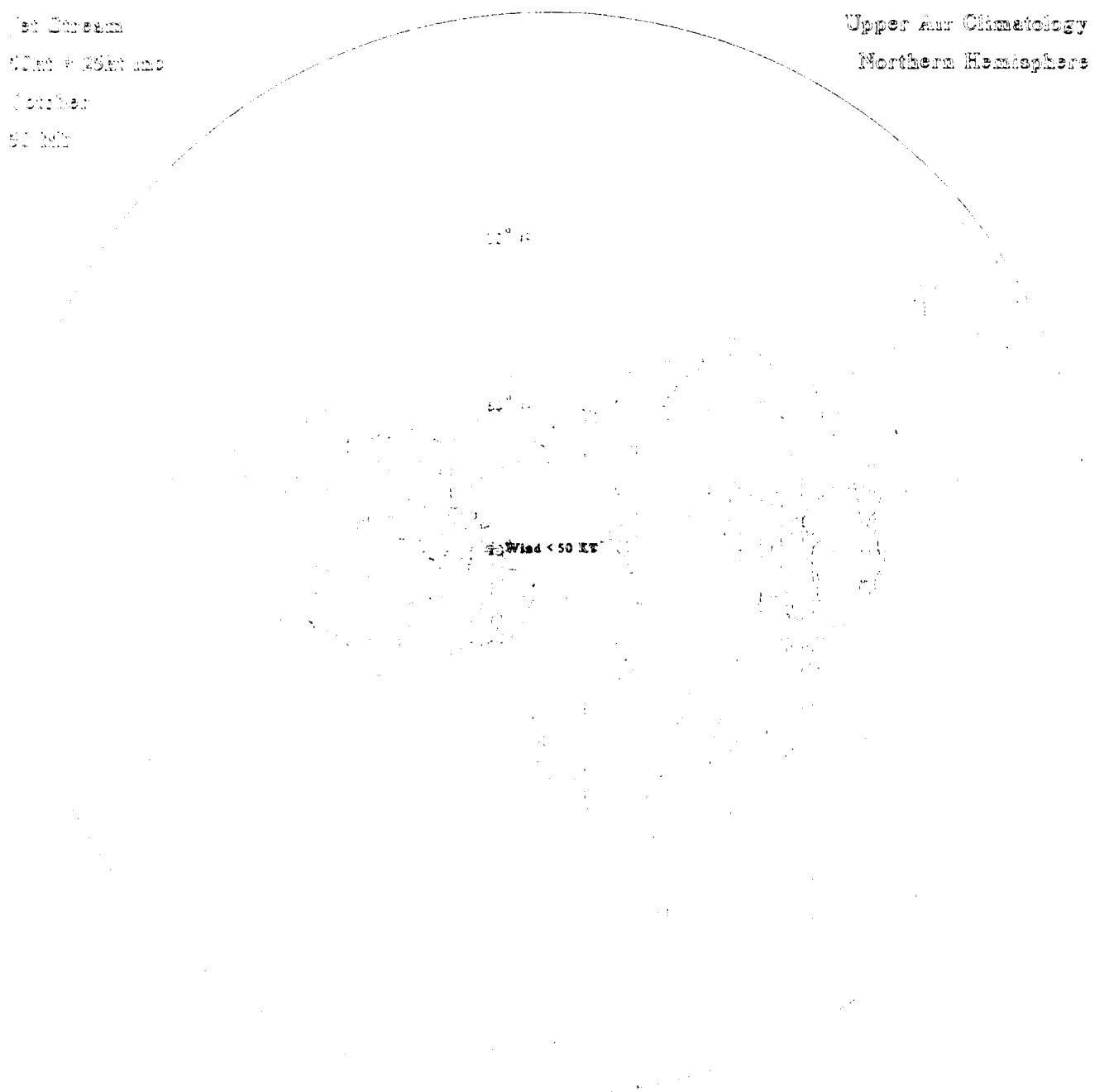
Upper Air Climatology
Southern Hemisphere

500 mb
500 mb
500 mb
500 mb



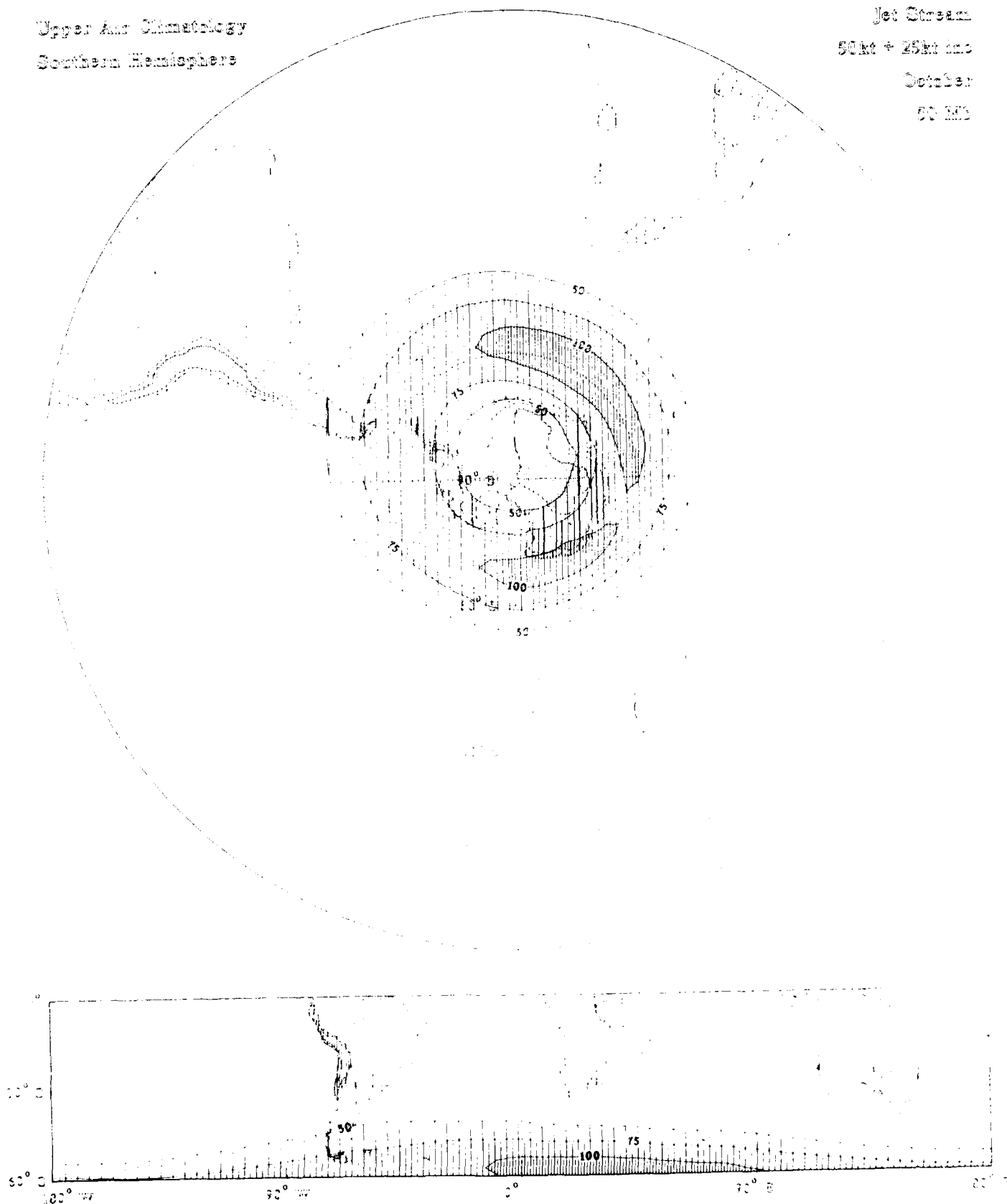
Jet Stream
500mb + 250mb and
700mb
500mb

Upper Air Climatology
Northern Hemisphere



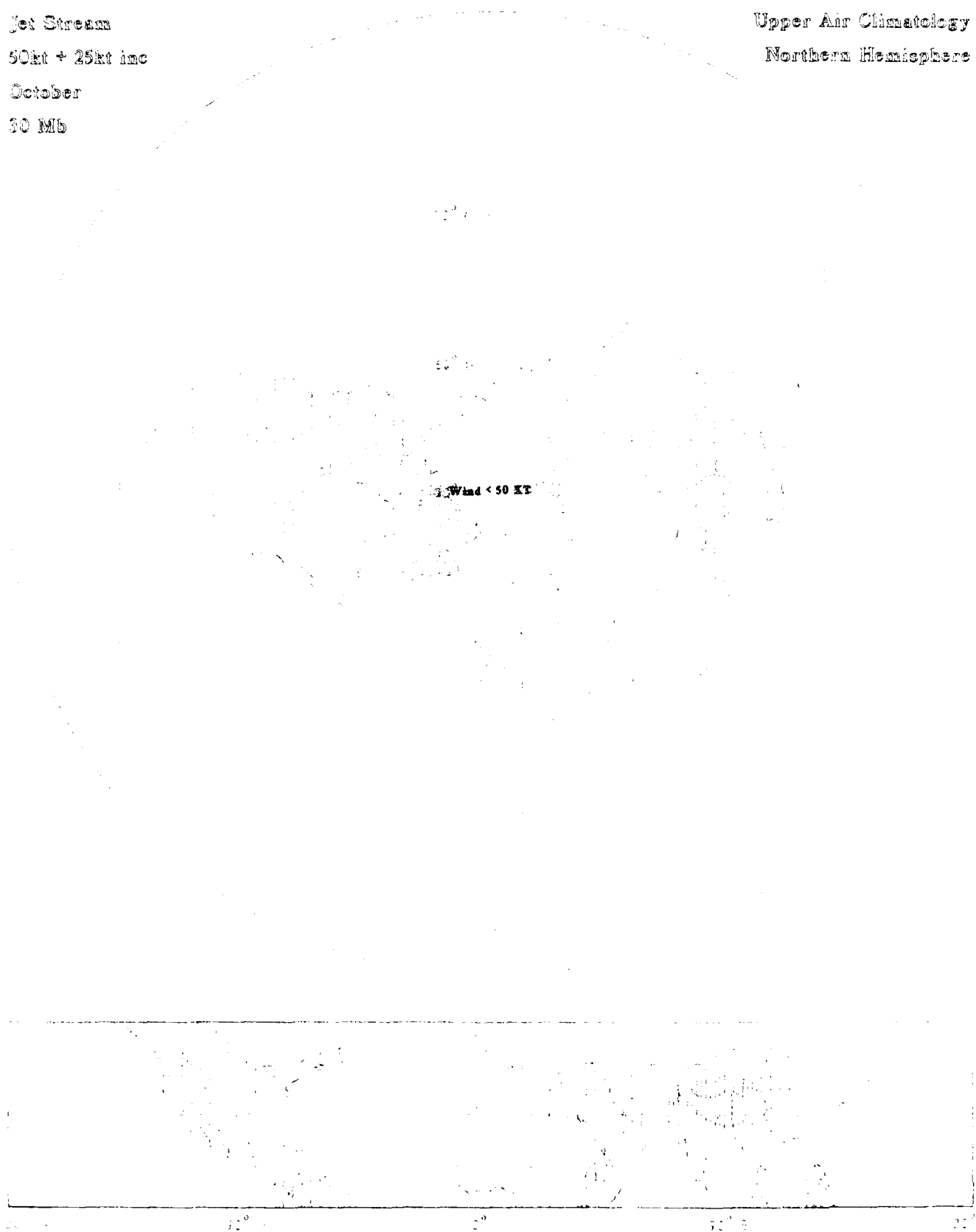
Upper Air Climatology
Southern Hemisphere

Jet Stream
50kt + 25kt inc
October
50 MB



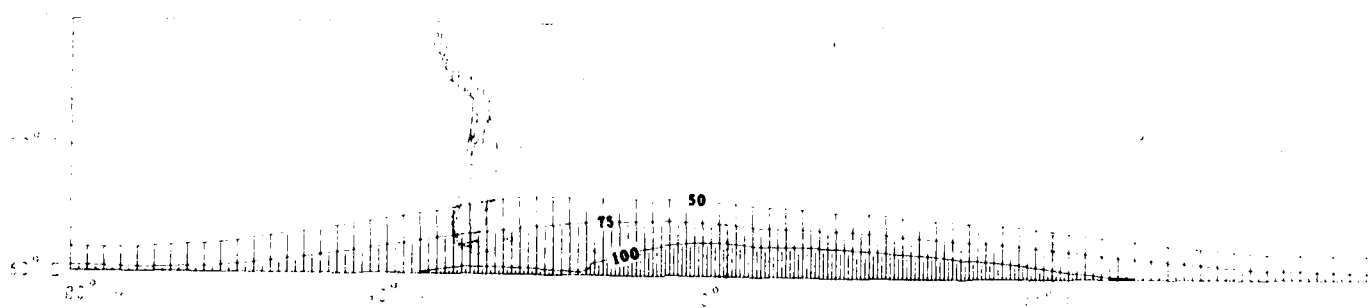
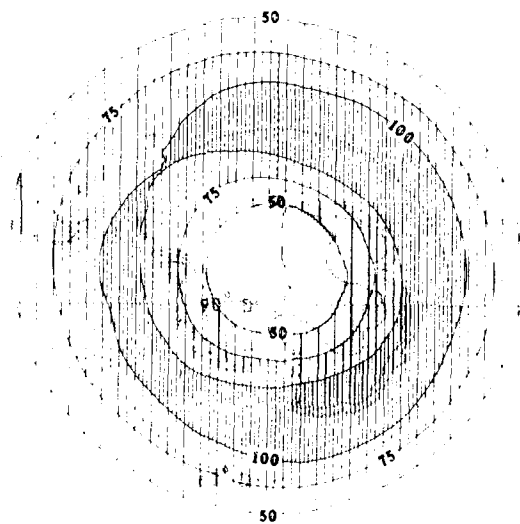
Jet Stream
50kt + 25kt inc
October
30 Mb

Upper Air Climatology
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

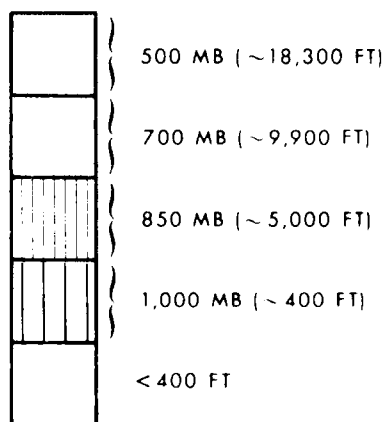
Jet Stream
500hPa + 600hPa and
700hPa
500hPa



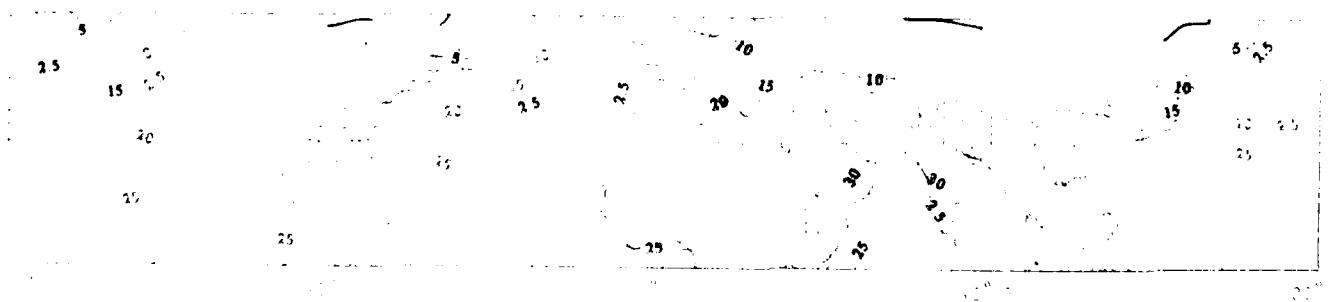
TEMPERATURE
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean temperature (solid and dashed lines) in °C; solids labeled, dashed intermediates unlabeled
- Temperature labeled interval: 5°C
- Contours of standard deviation of temperature (dotted lines) in °C
- Standard deviation of temperature labeled interval: 2.5°C
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE

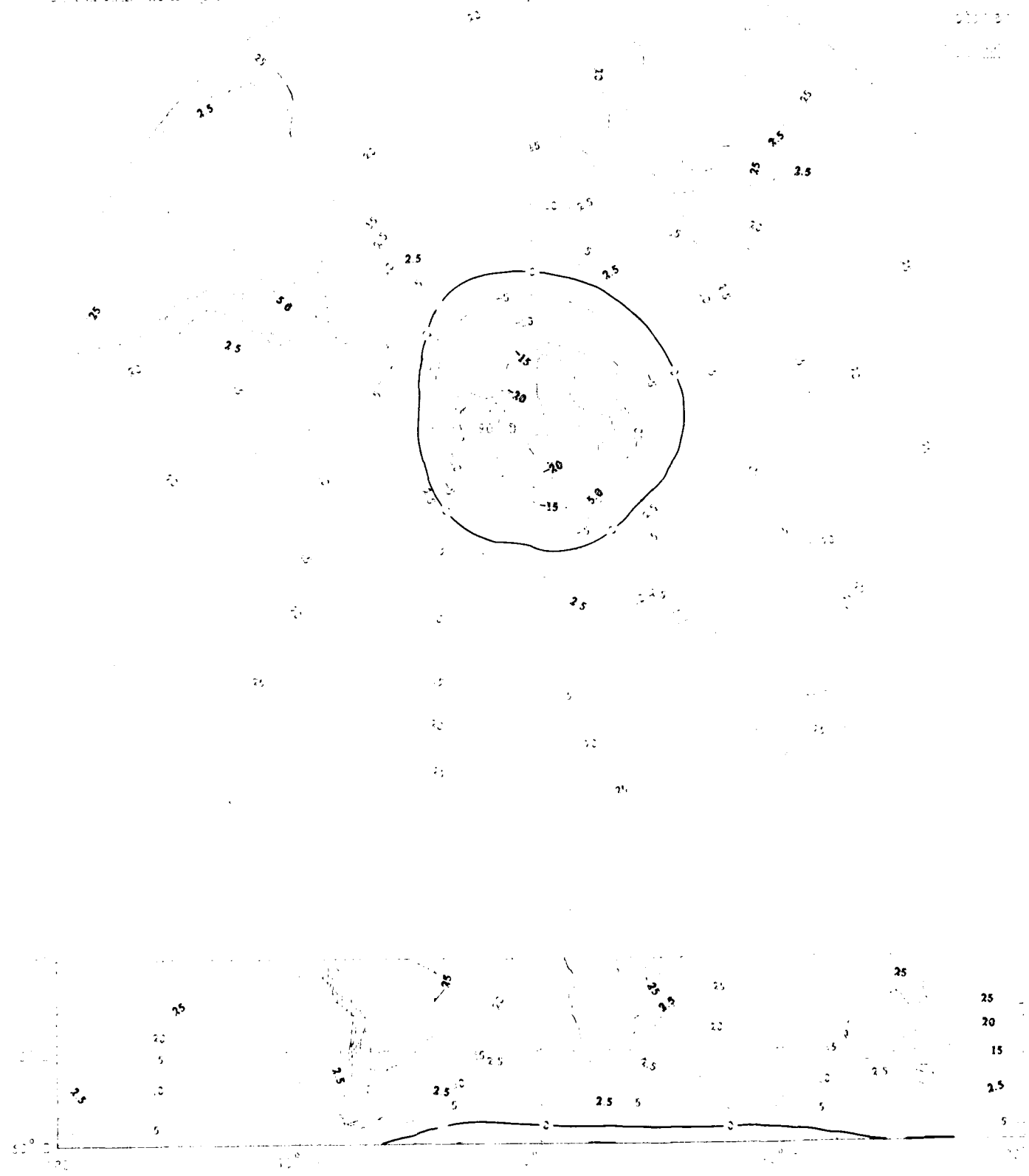


Journal of Management Education 30(6)p. 789-804
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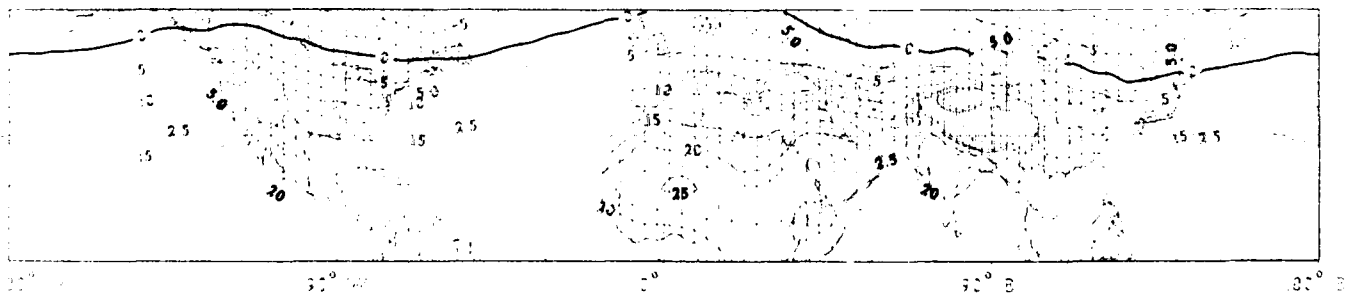
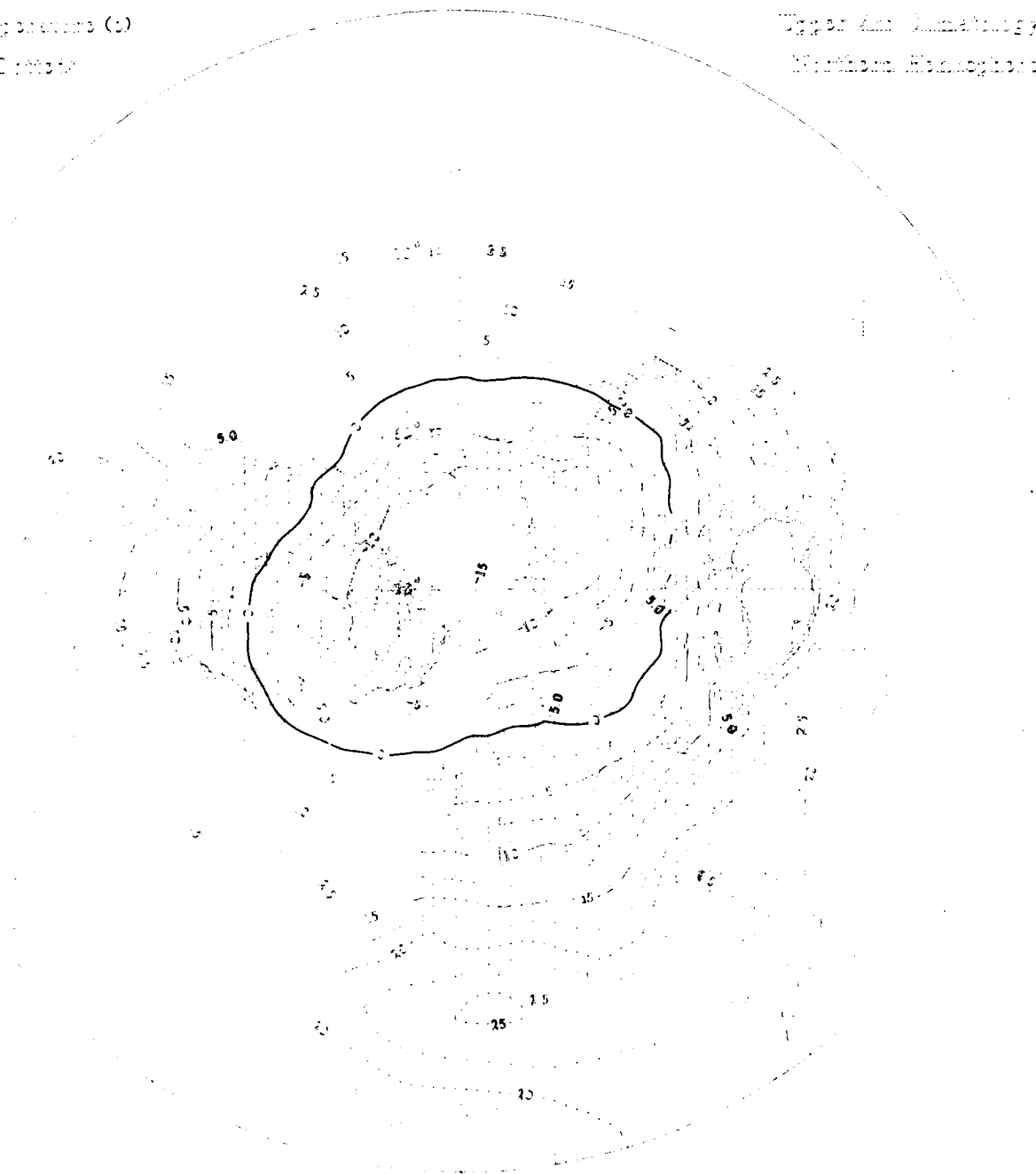
1951-52 Annual Report
 National Oceanographic

Mean Temperature (°C)
 2000-1950
 1951-52



2000

Statistical Analysis



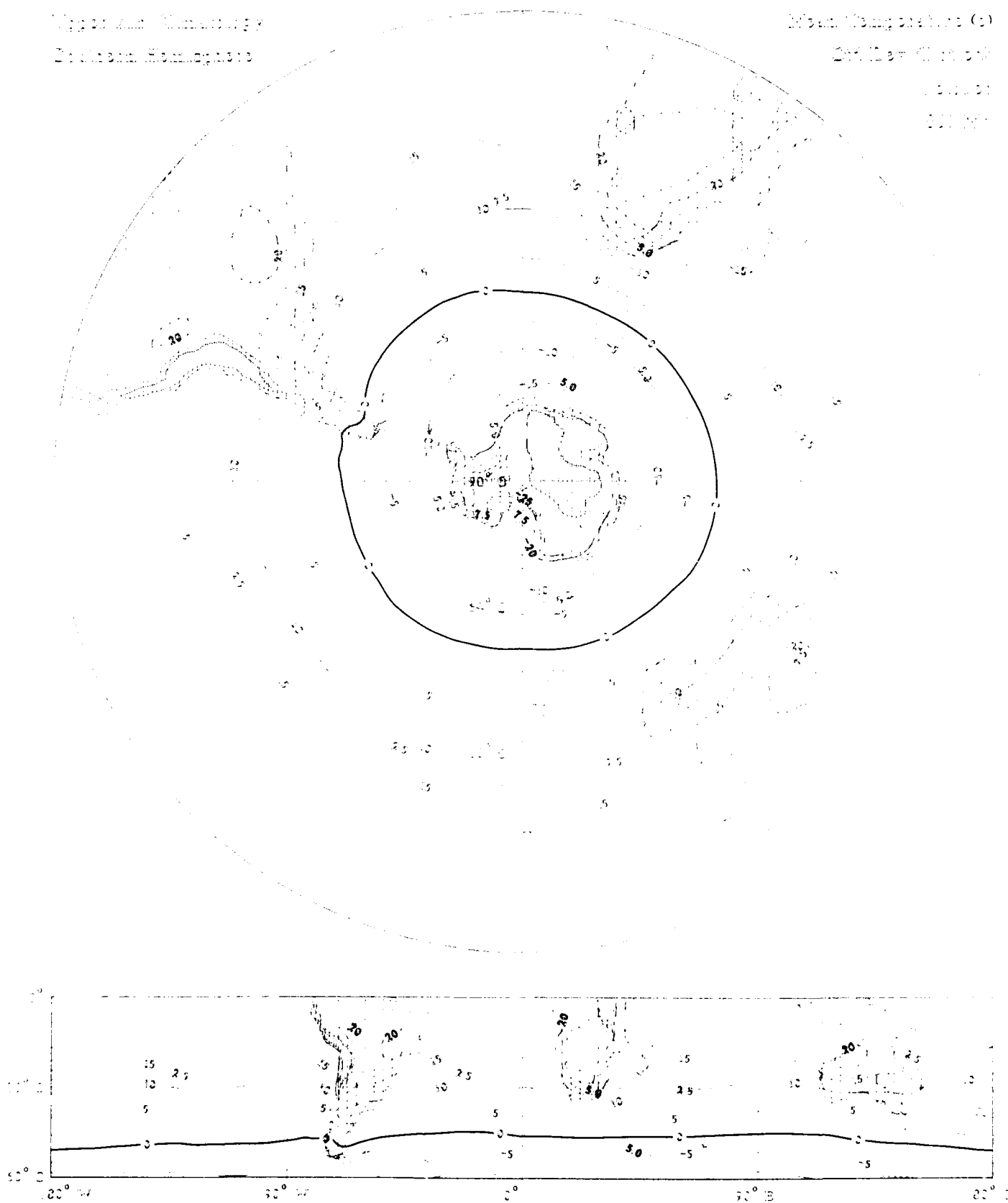
Upper Air Temperature
 Southern Hemisphere

Mean Temperature (°C)

200 hPa (10000 ft)

1950-51

0000 UTC



Mean Temperature (°C)

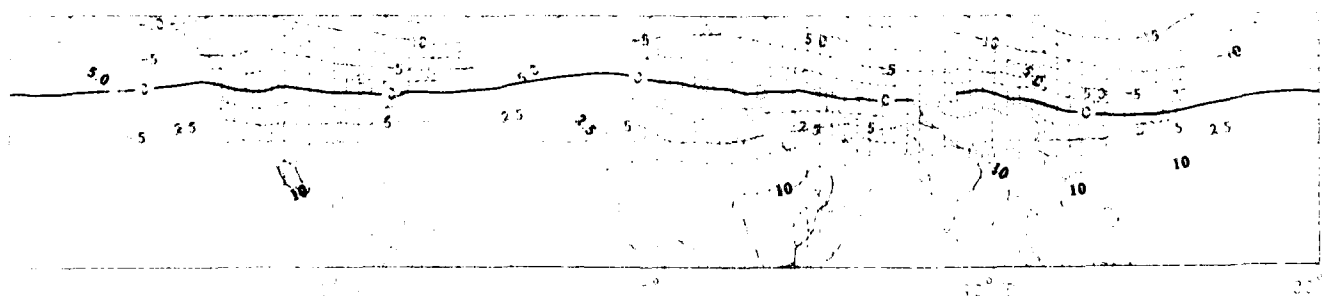
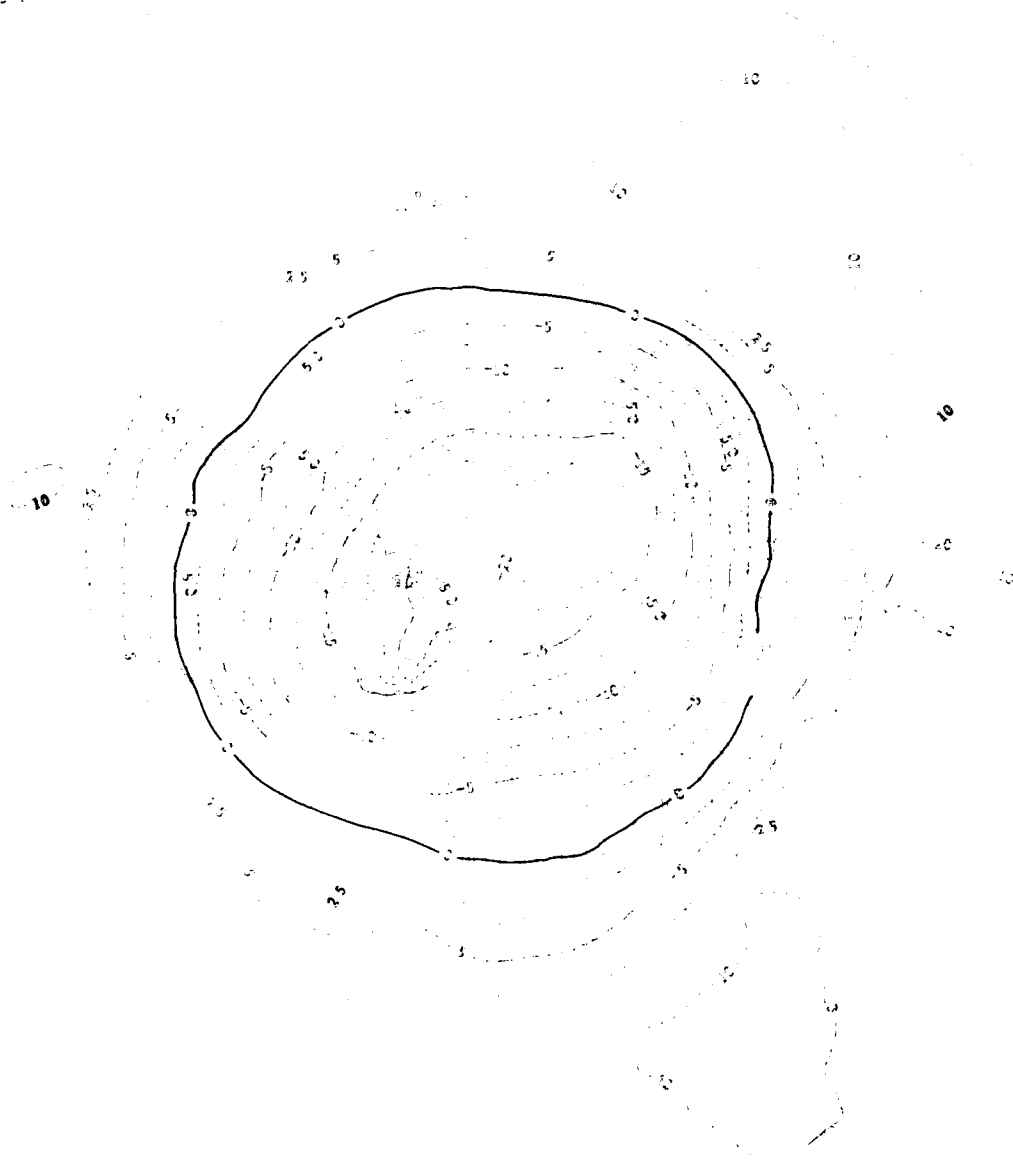
Sea Day Climate

1911-12

1912-13

Topical and Climatology

Western Hemisphere



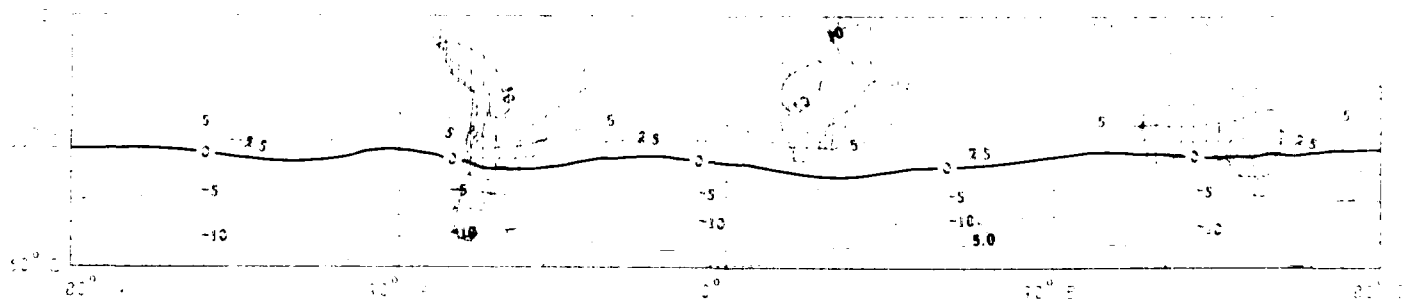
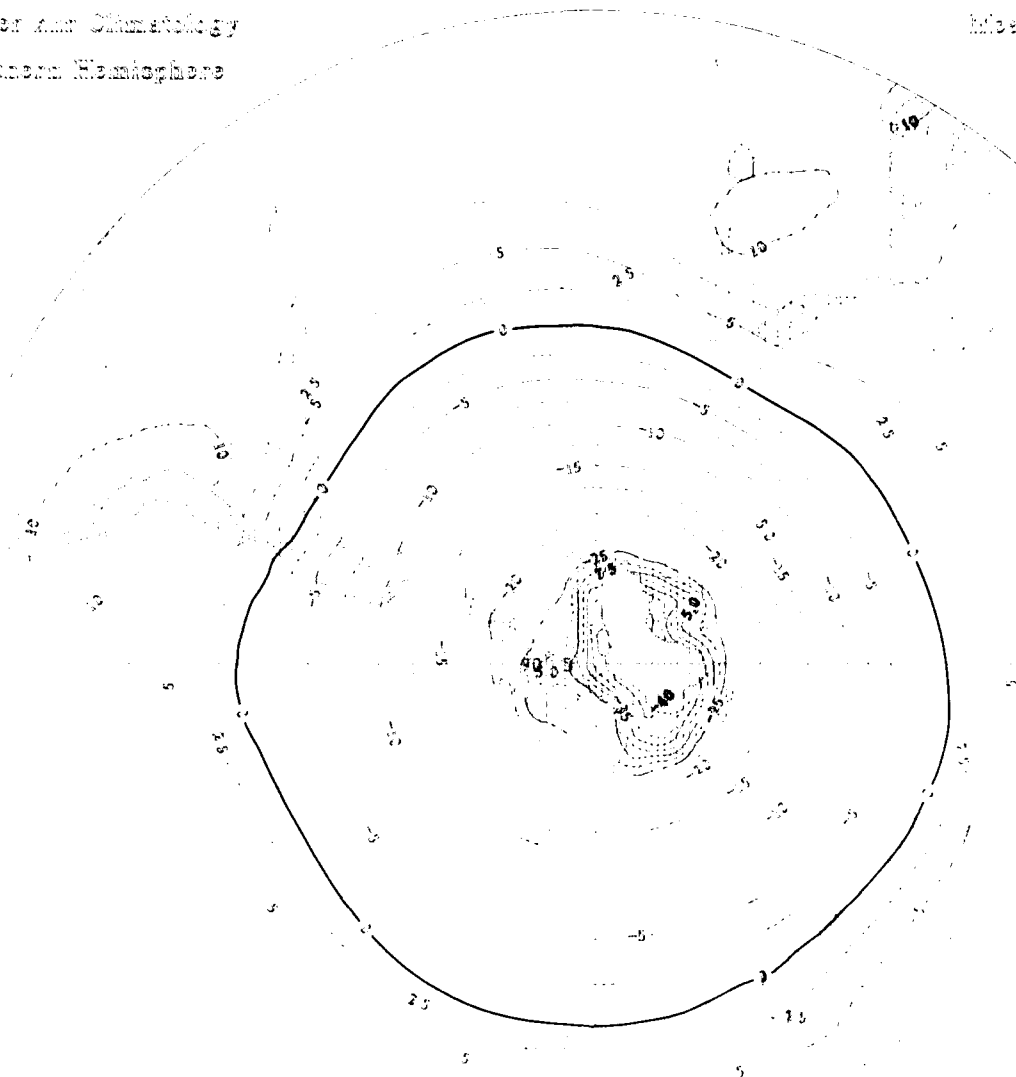
Upper Air Climatology
Southern Hemisphere

Mean Temperature (°C)

2nd Day (1960)

Station

1960



Mean Temperature (°C)

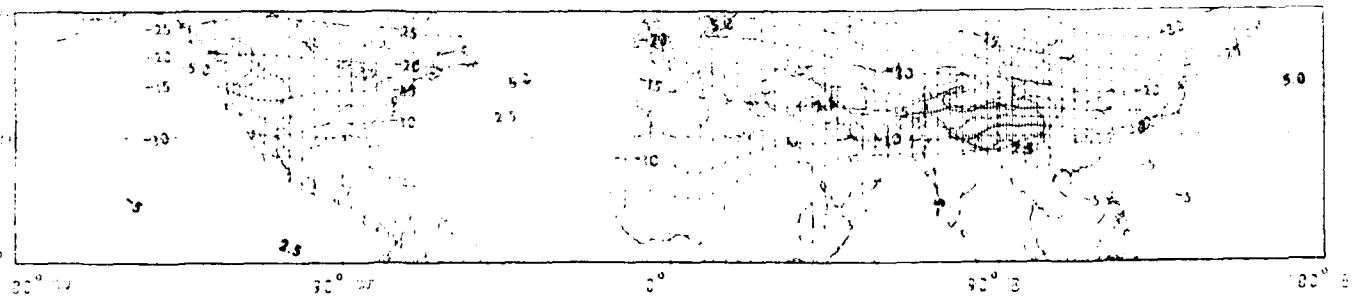
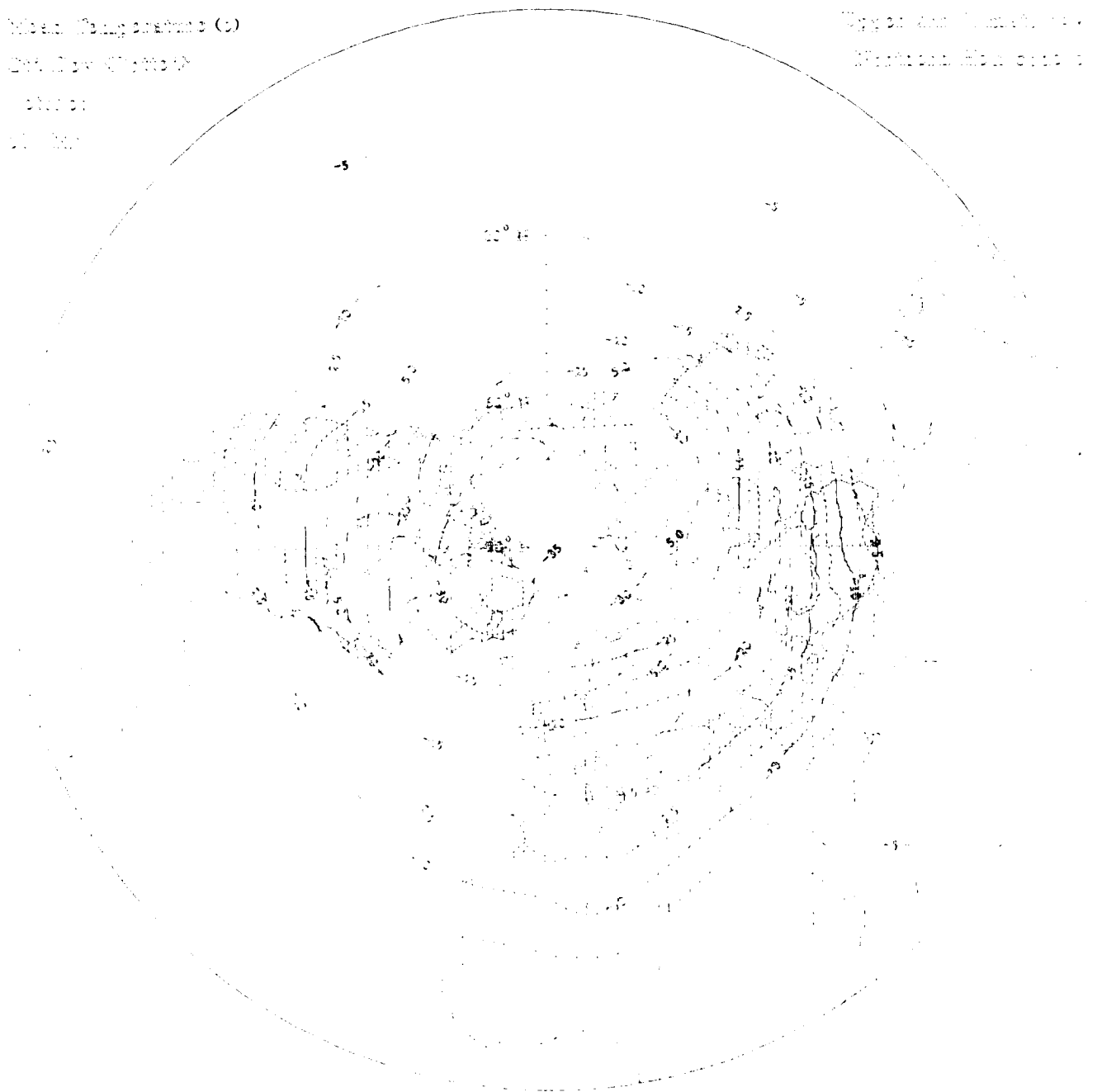
Oct. 1950 - Oct. 1951

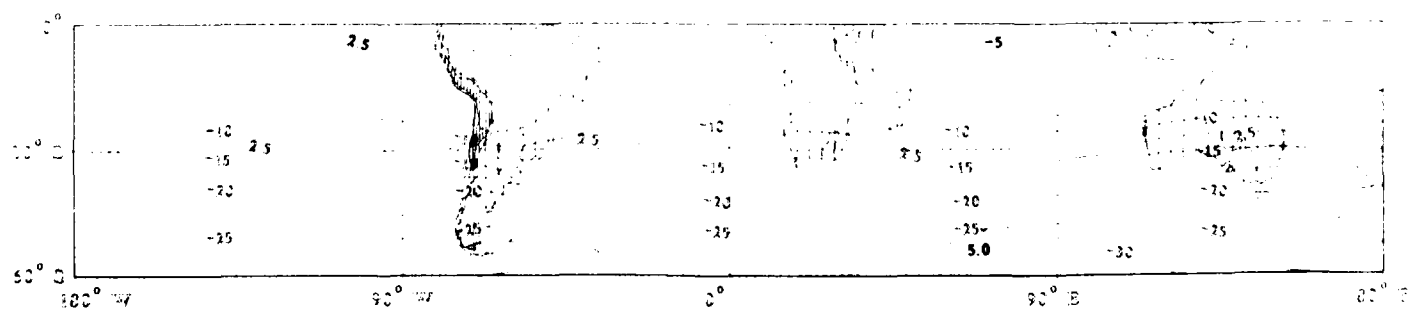
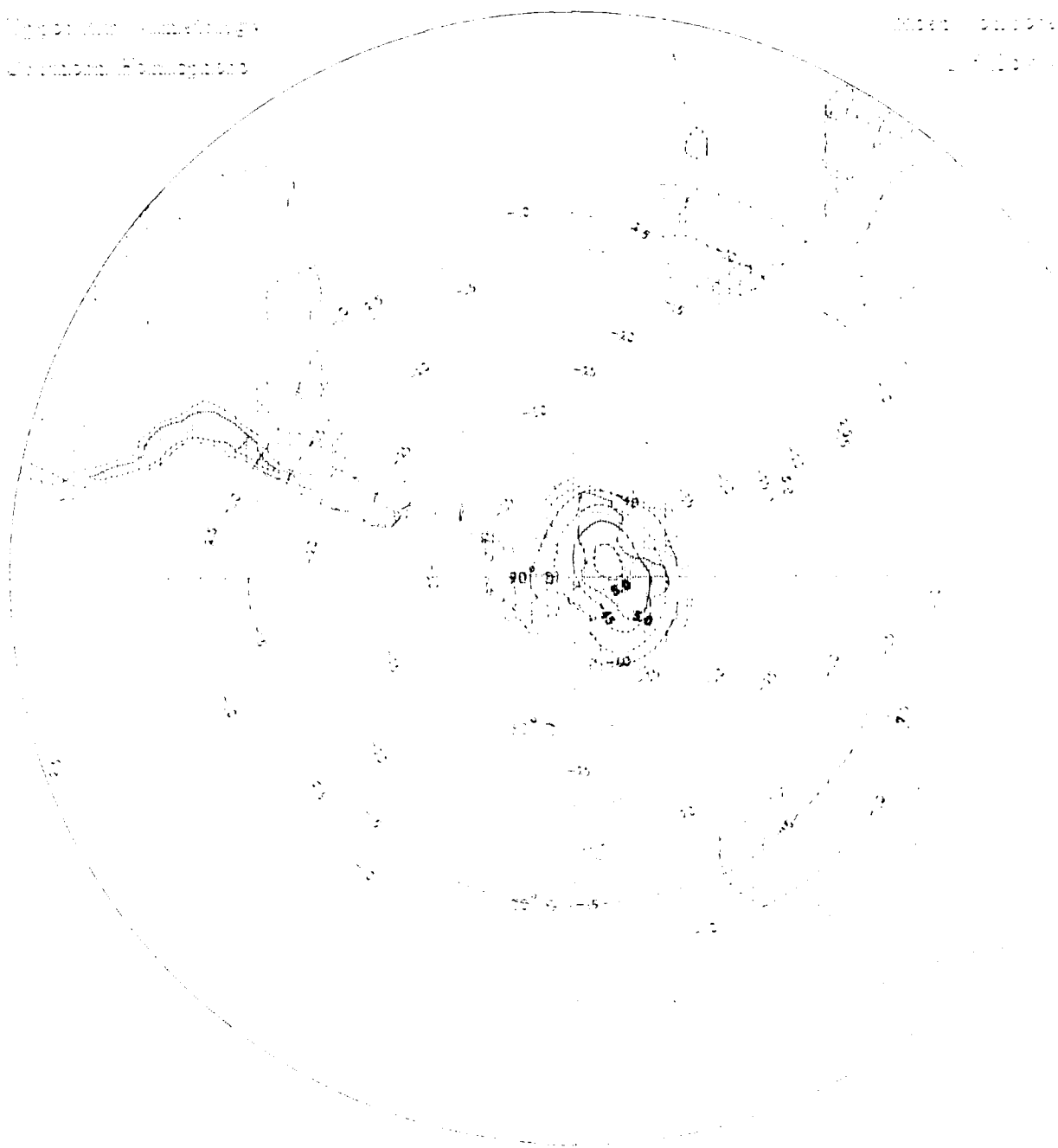
1950

1951

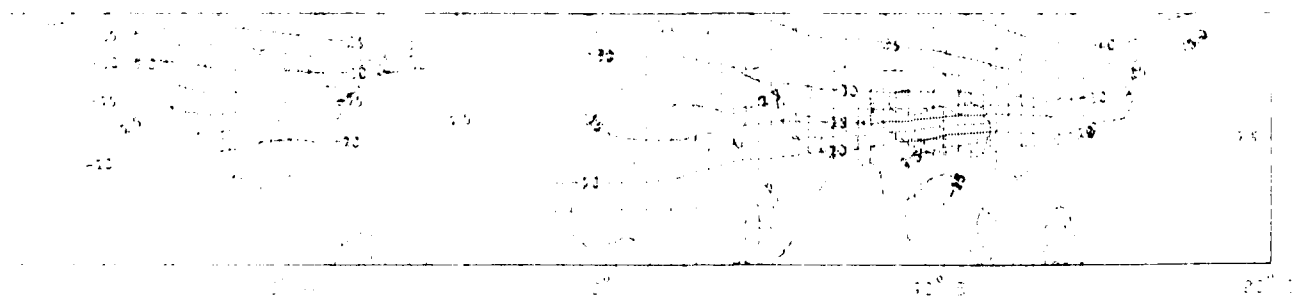
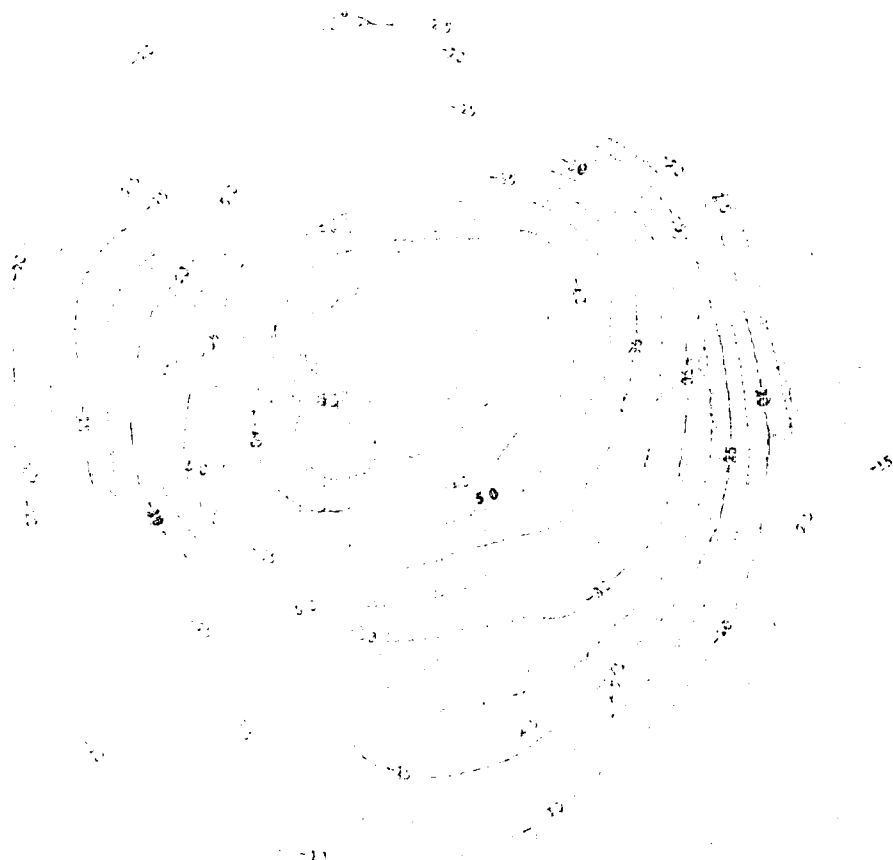
Temperature (°C)

1950 - 1951



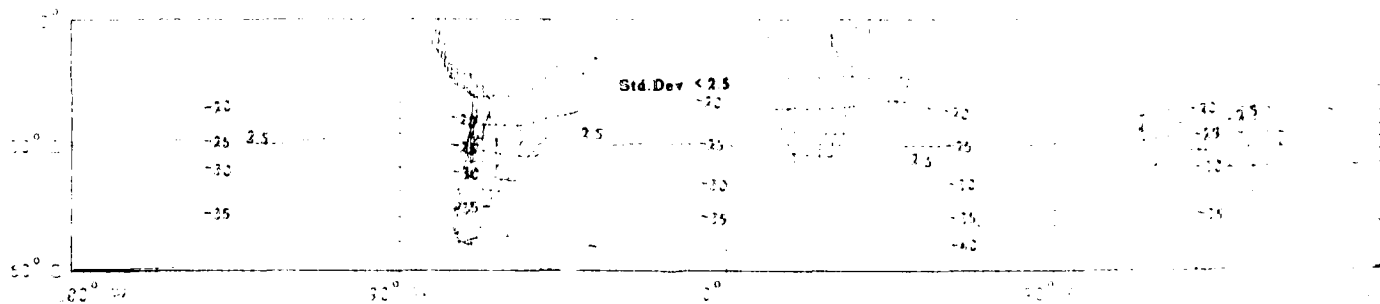
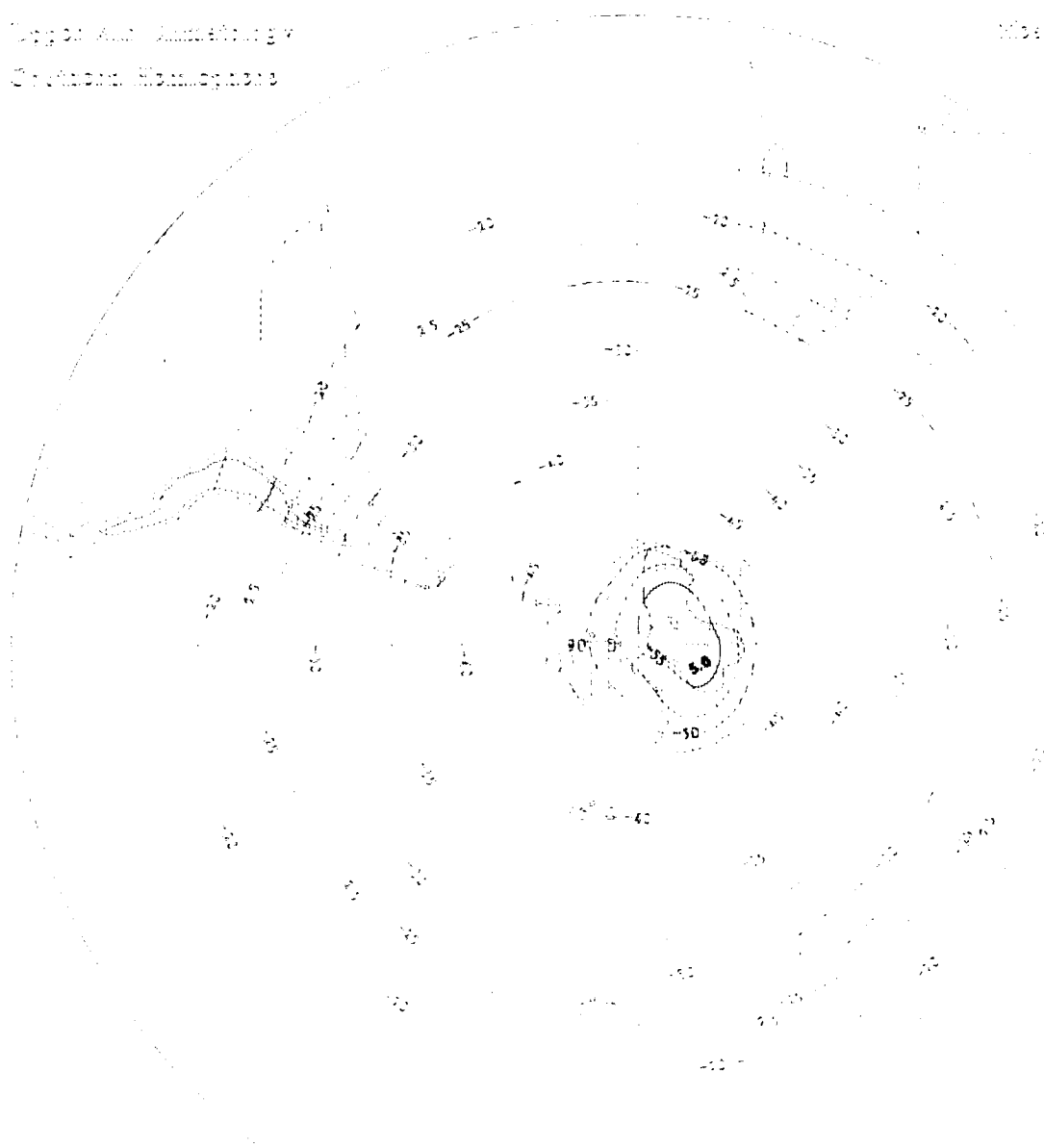


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Topog. And. Limiting
 Section Homographs

Mean Temperature (°)
 24.0 - 25.0
 26.0 - 27.0
 28.0 - 29.0



Mean Temperature (c)

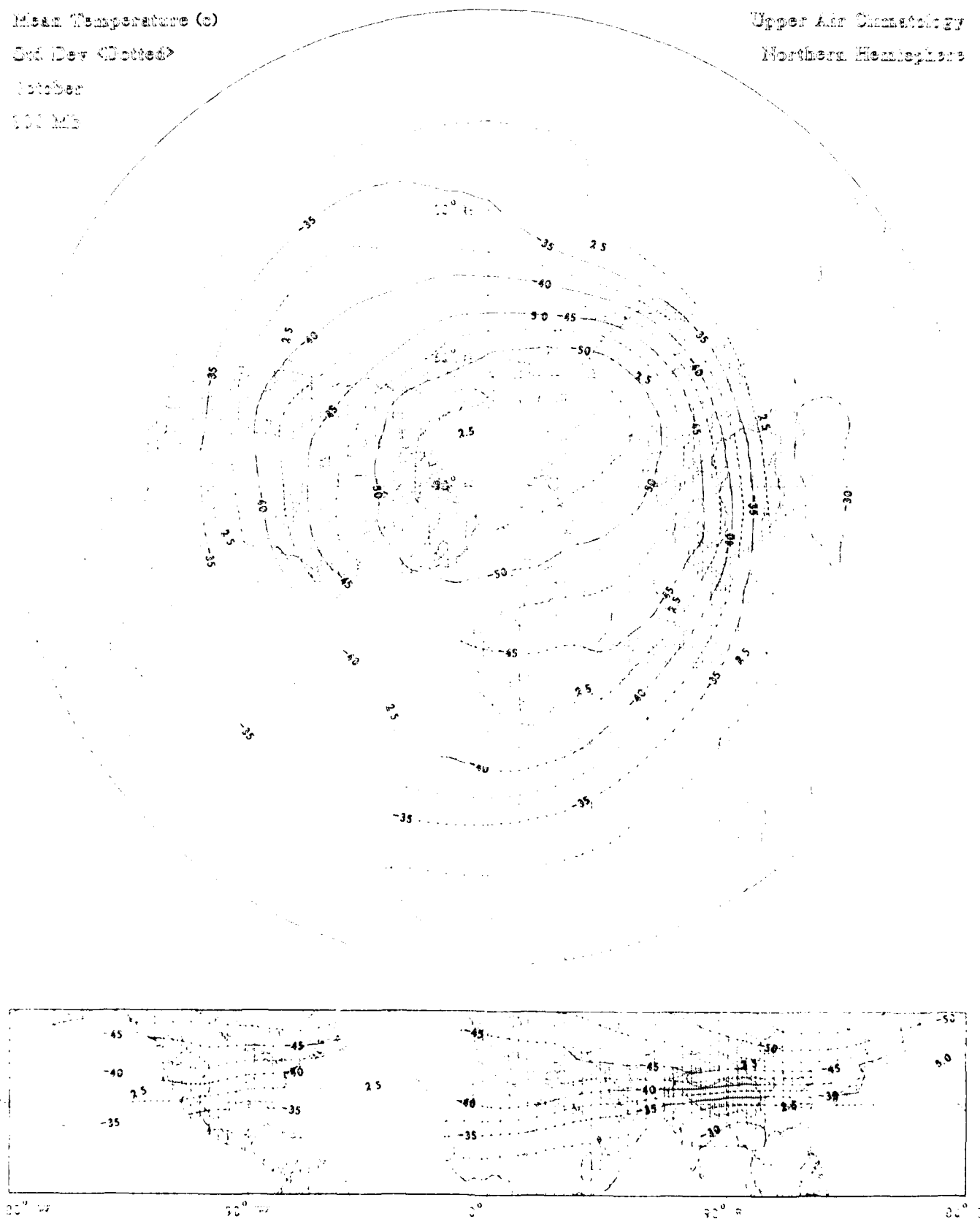
Std Dev (Dotted)

October

100 MB

Upper Air Climatology

Northern Hemisphere



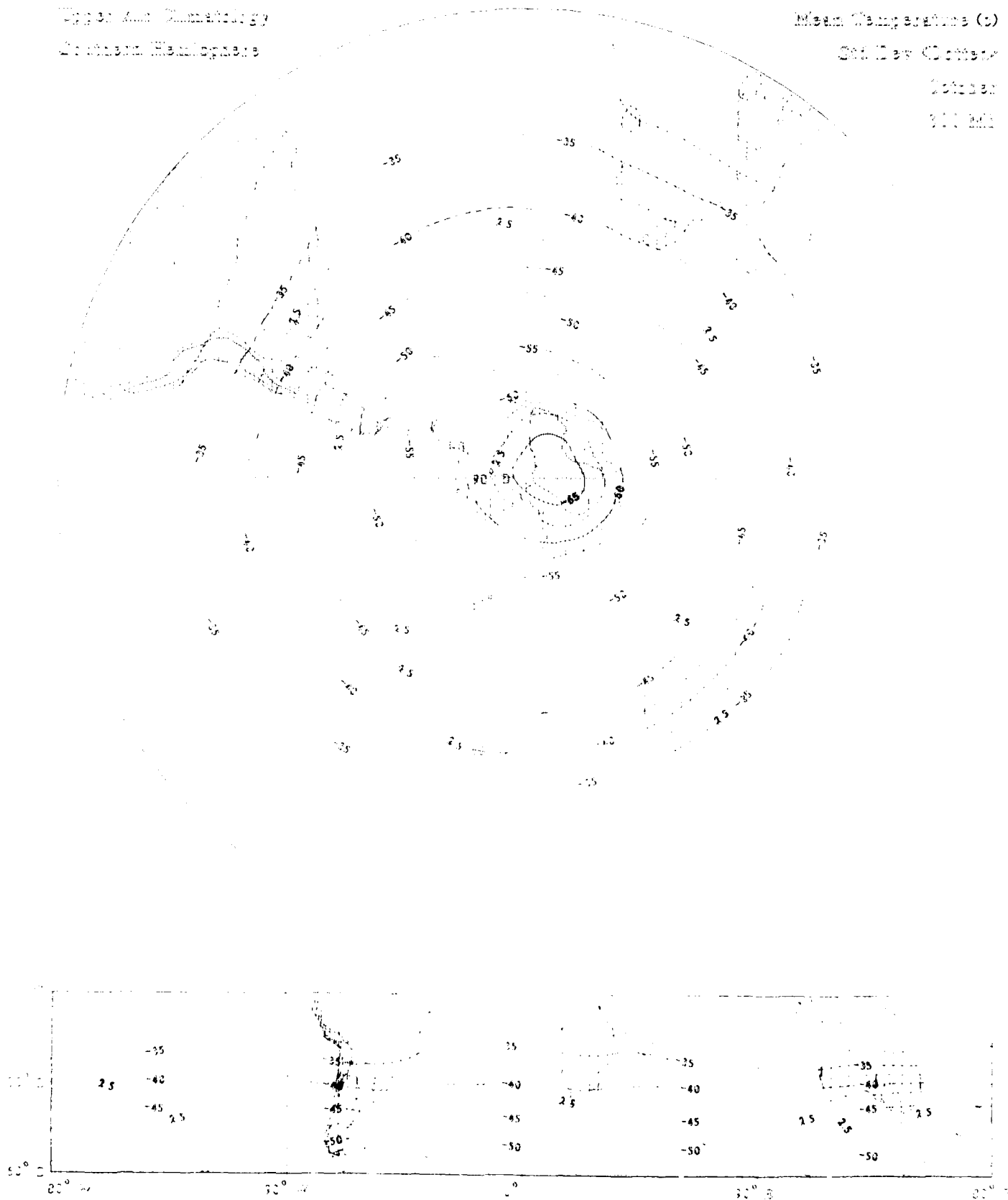
Depth and Climatology
 Southern Hemisphere

Mean Temperature (°C)

Sea Level Climate

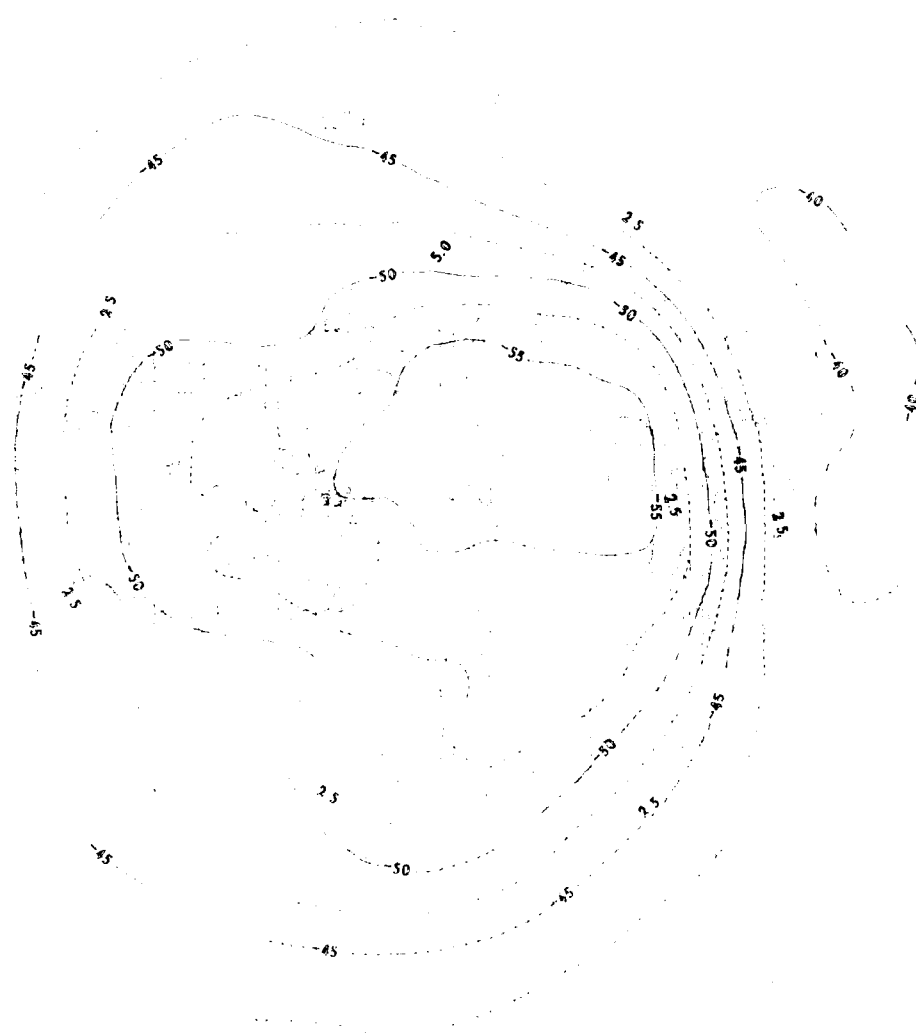
1951-1980

1951-1980



Mean Temperature (c)
 Std Dev (Dotted)
 October
 1951-1952

Upper Air Climatology
 Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Temperature (°C)

Oct Day 1 (1950)

1000 hPa

1000 hPa



Mean Temperature (°C)

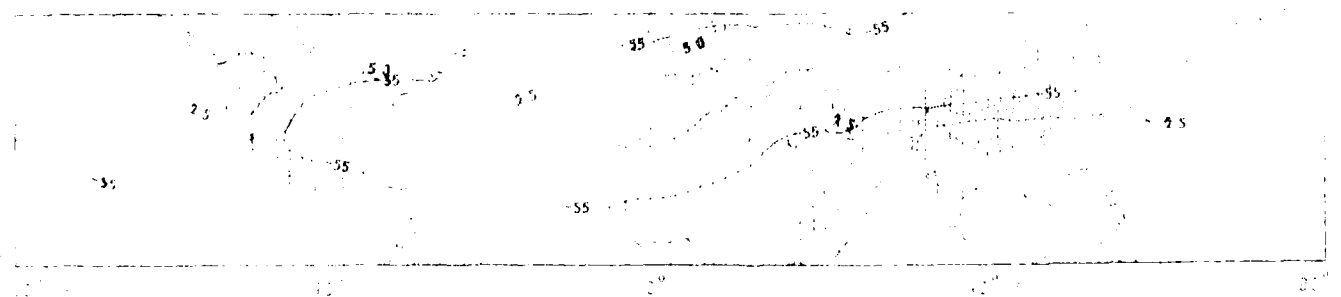
July 1967

Station

1967

July 1967

Station



Types and Densities
 of the Hamlet

Mean Temperature (C)

July 1950

1950

1950



Mean Temperature (c)

Std Dev (Dotted)

October

150 Mb

Upper Air Climatology

Northern Hemisphere

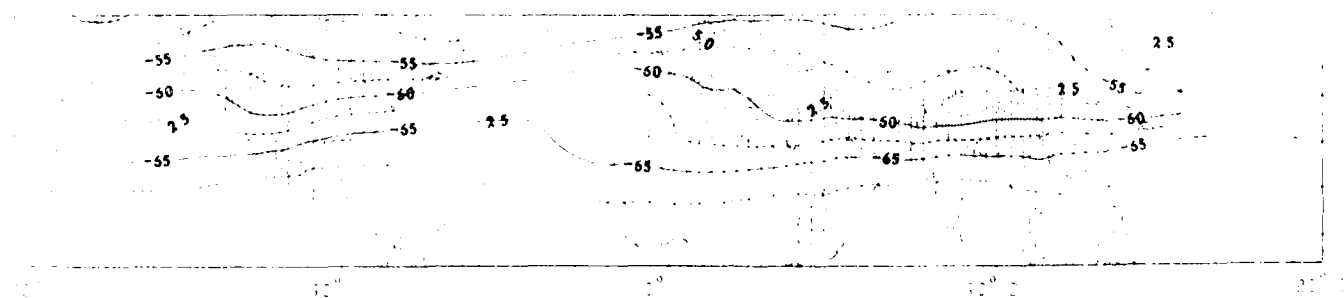
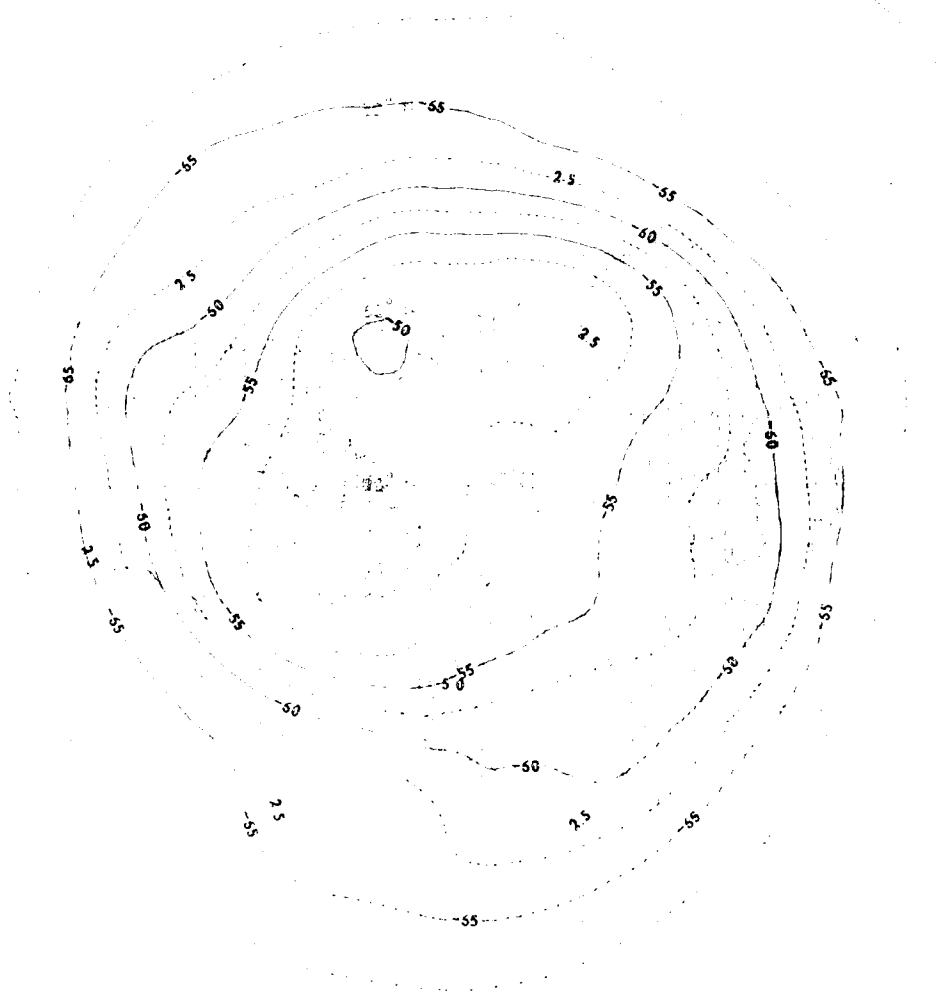


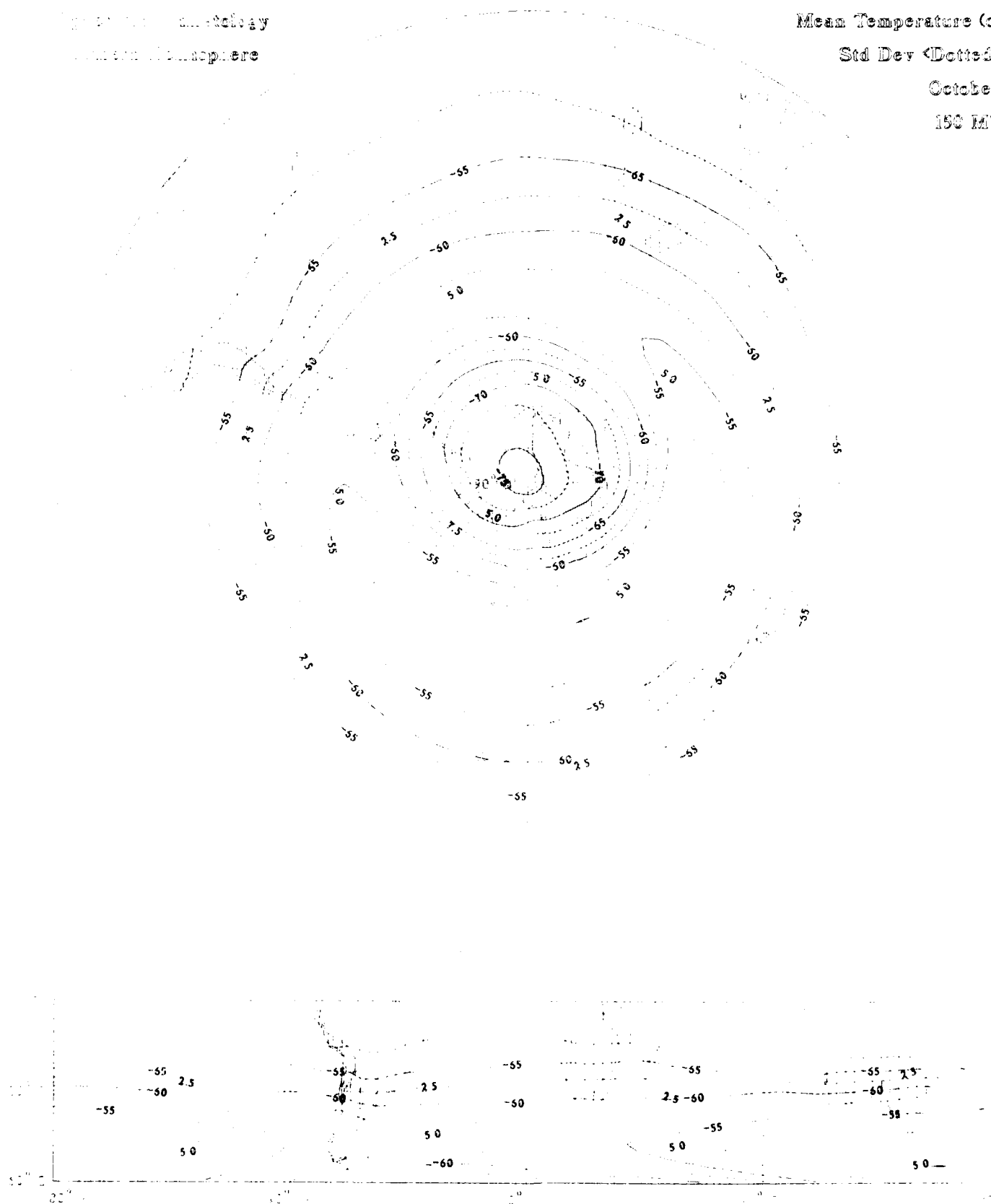
Figure 10. Contour map of
 Mean Temperature (°C)

Mean Temperature (°C)

Std Dev (Dotted)

October

150 ML



Mean Temperature (°C)

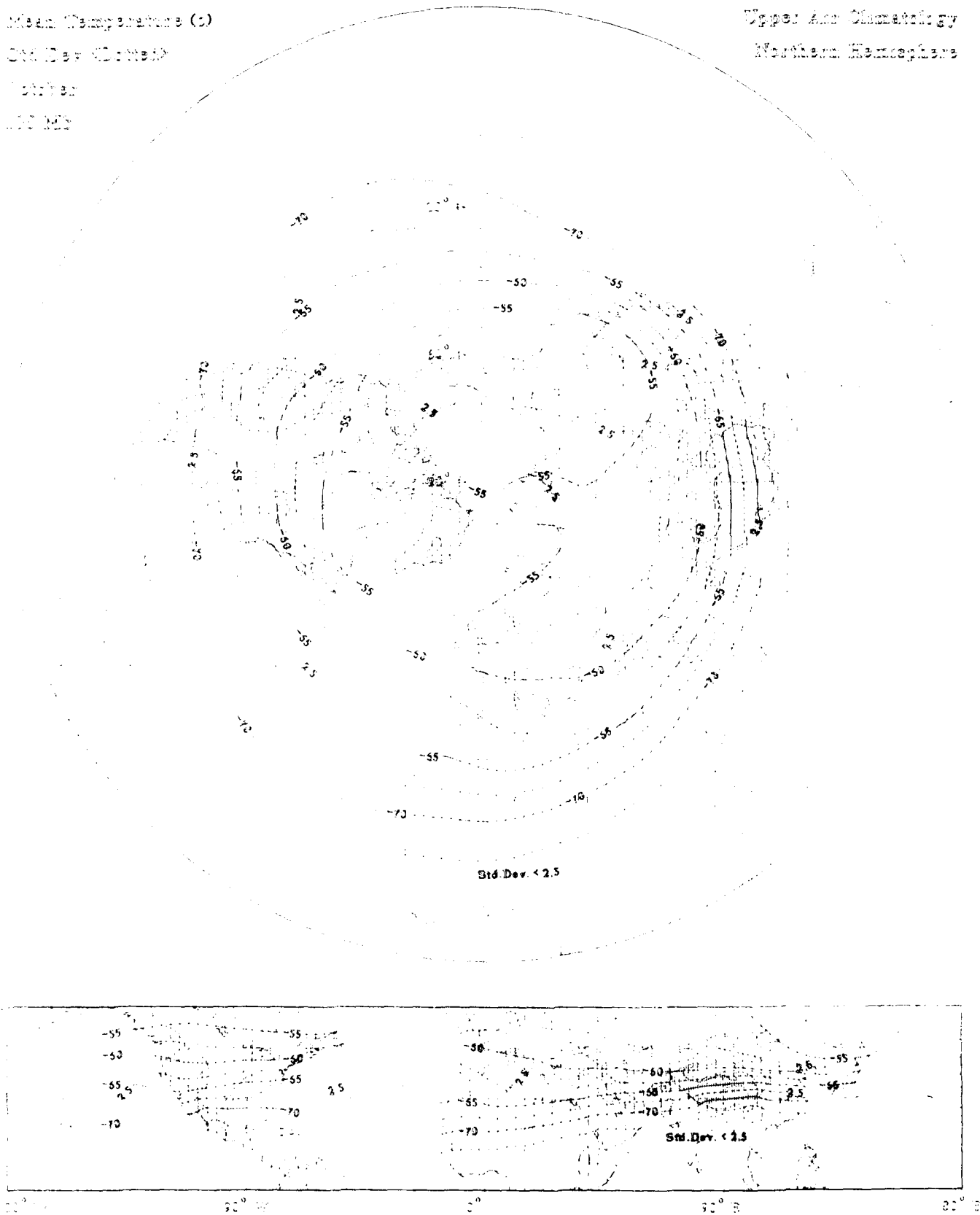
Std. Dev. (°C)

1000hPa

1000hPa

Upper Air Climatology

Northern Hemisphere



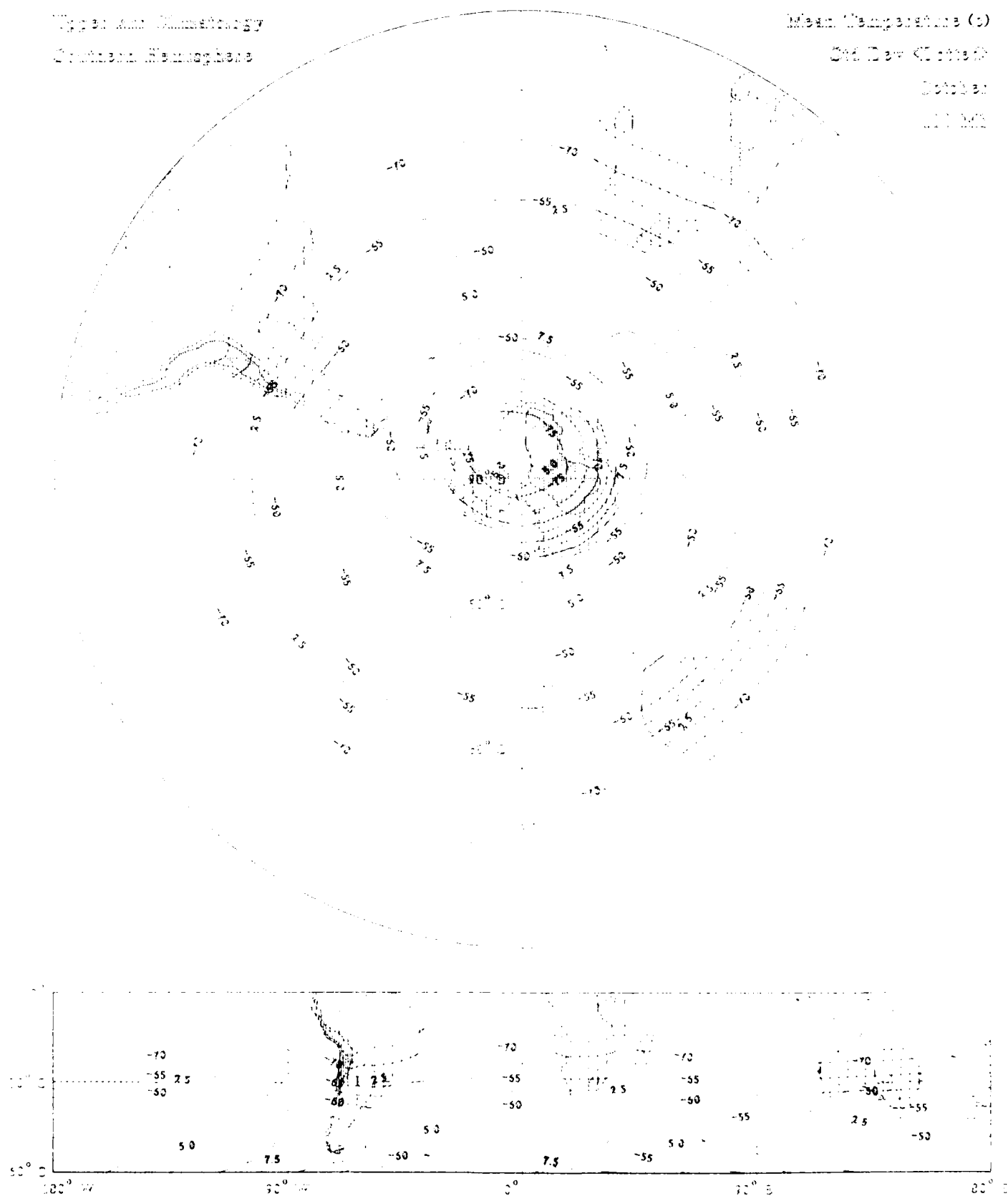
Types and Characteristics
of the Atmosphere

Mean Temperature (°C)

0.0 to 1.0

1.0 to 2.0

2.0 to 3.0



Types and Geometry

Northern Hemisphere

2000



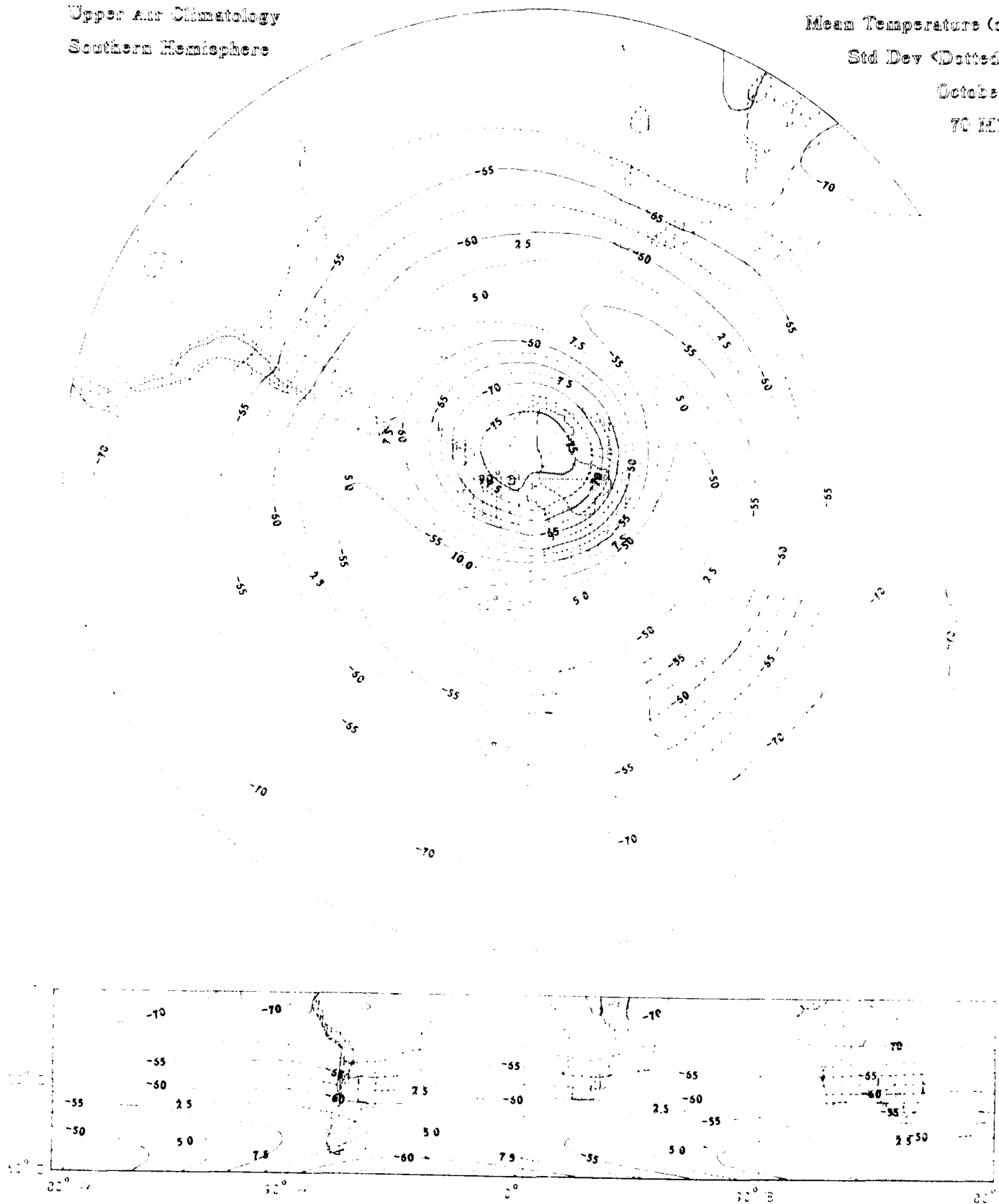
Upper Air Climatology
Southern Hemisphere

Mean Temperature (c)

Std Dev (Dotted)

October

70 MSL



Mean Temperature (c)

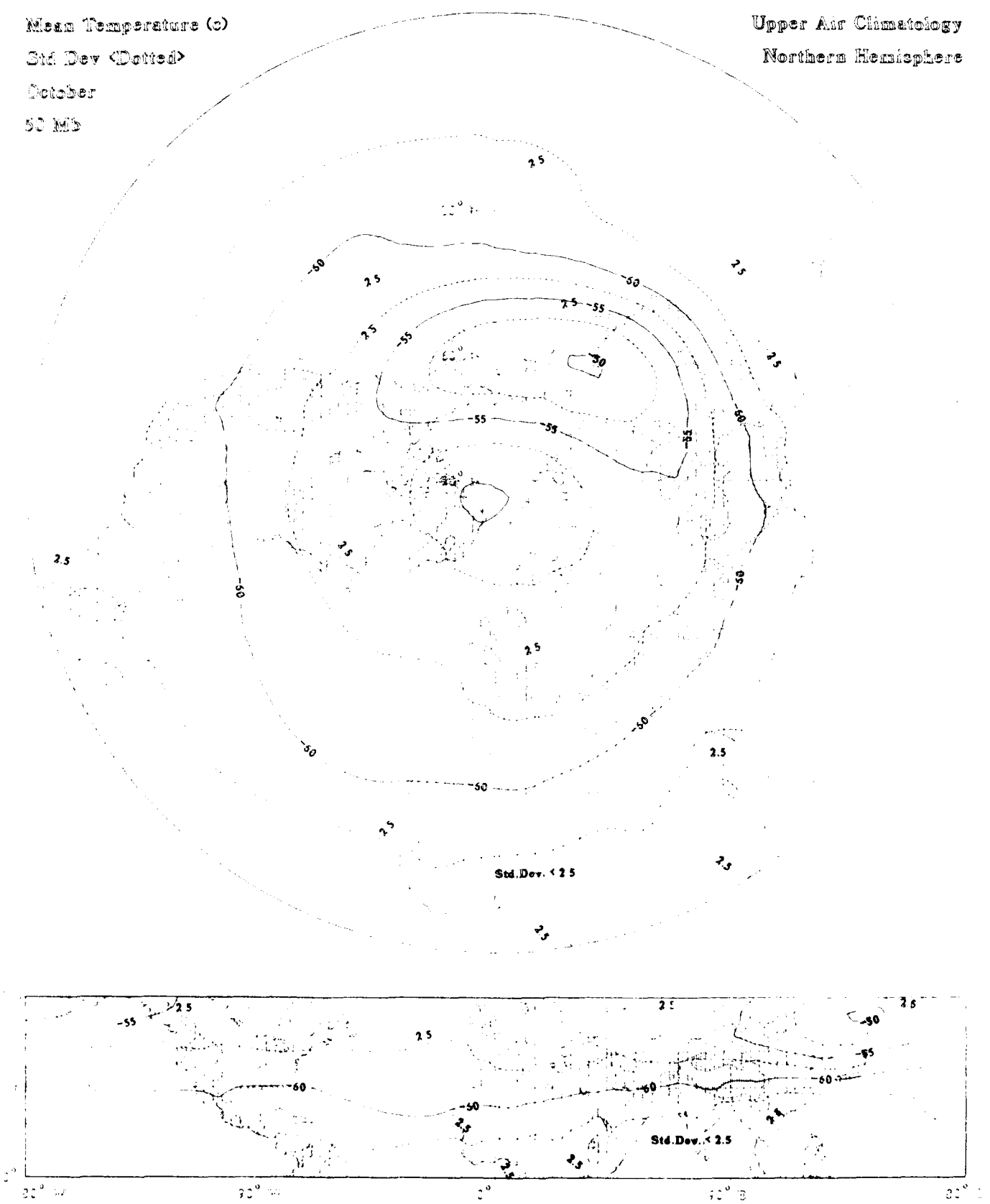
Std. Dev. (Dotted)

October

50 MB

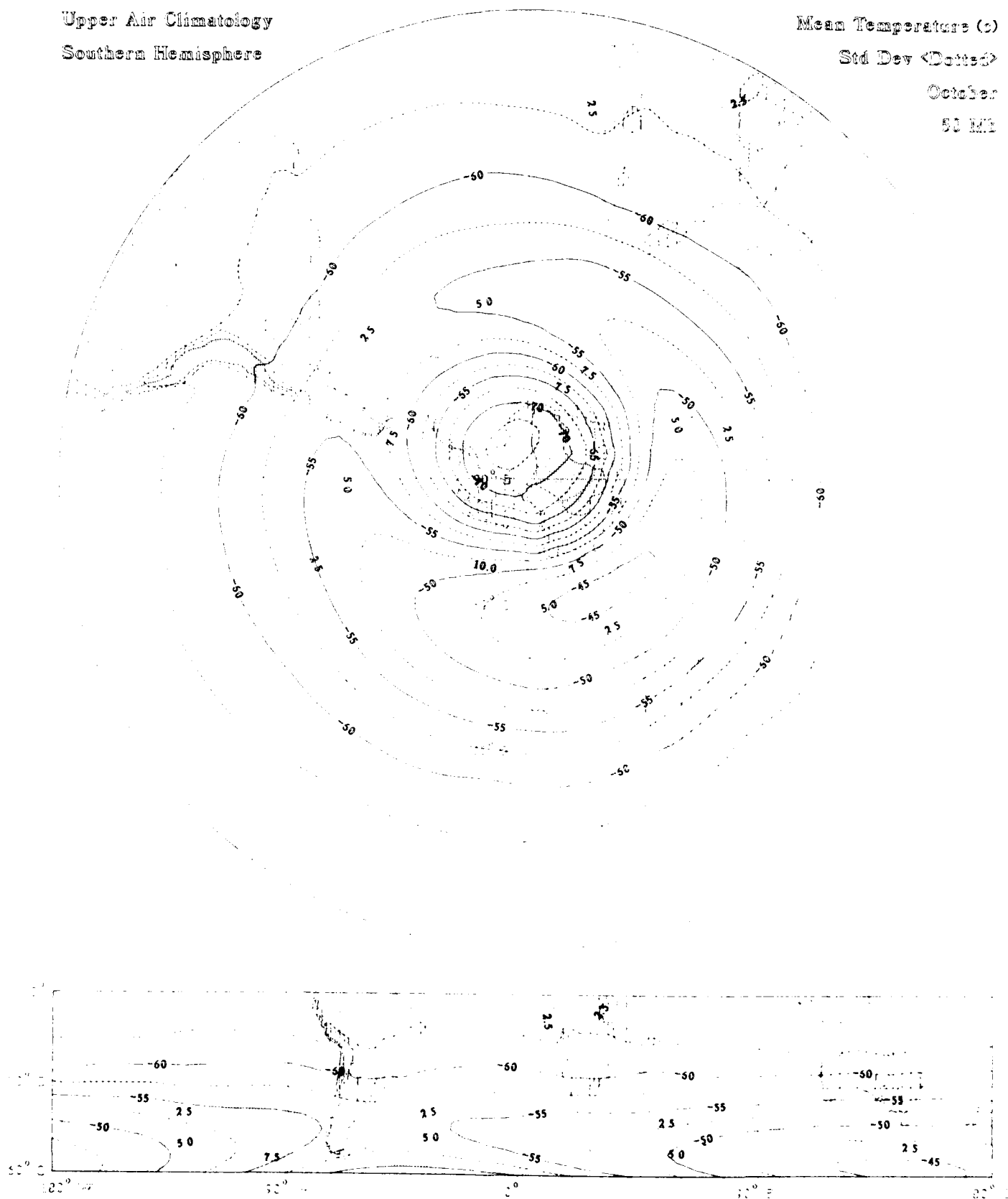
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Temperature (°)
Std Dev (Dotted)
October
50 MB



Mean Temperature (°C)

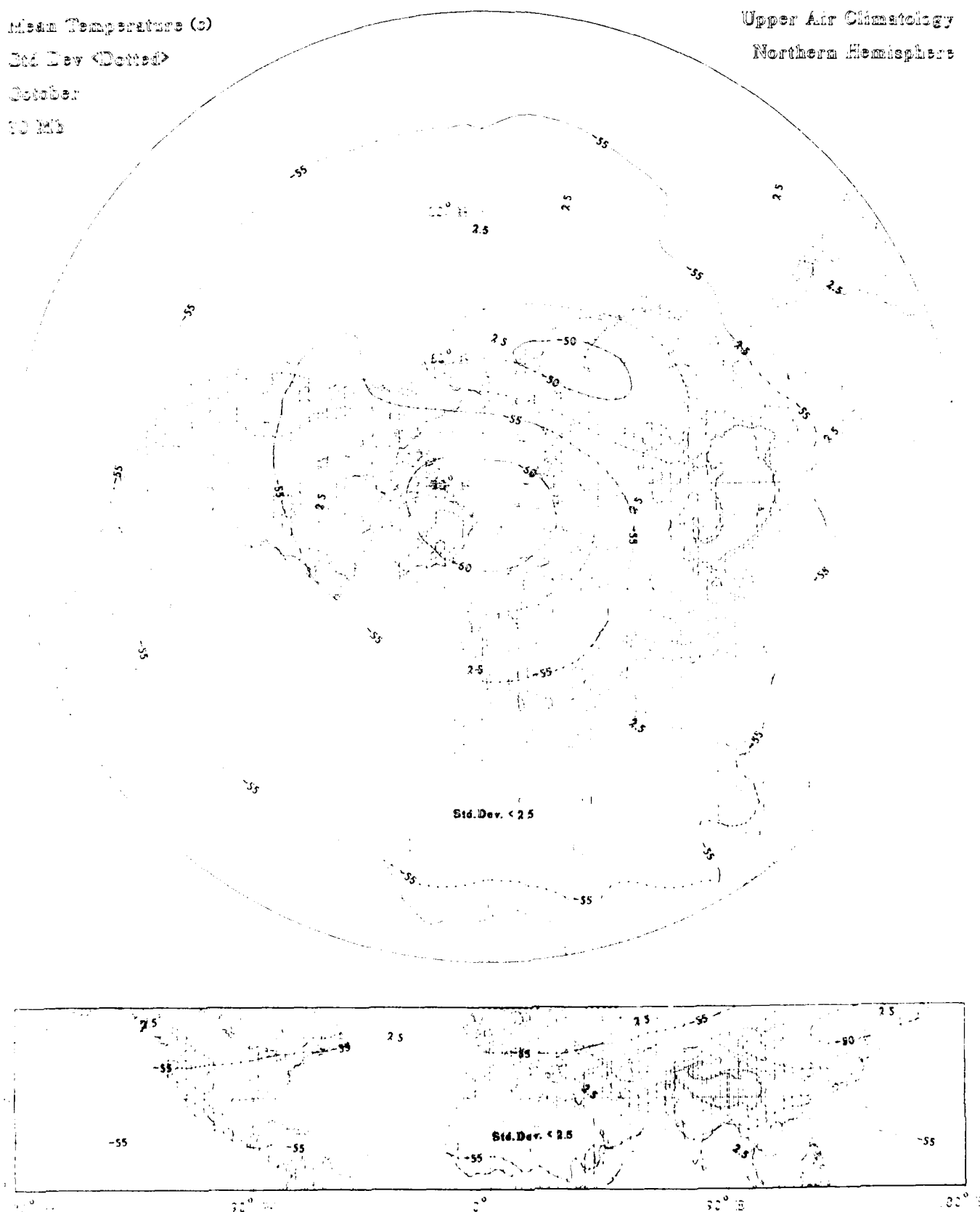
Std. Dev. (Dotted)

October

10 MB

Upper Air Climatology

Northern Hemisphere



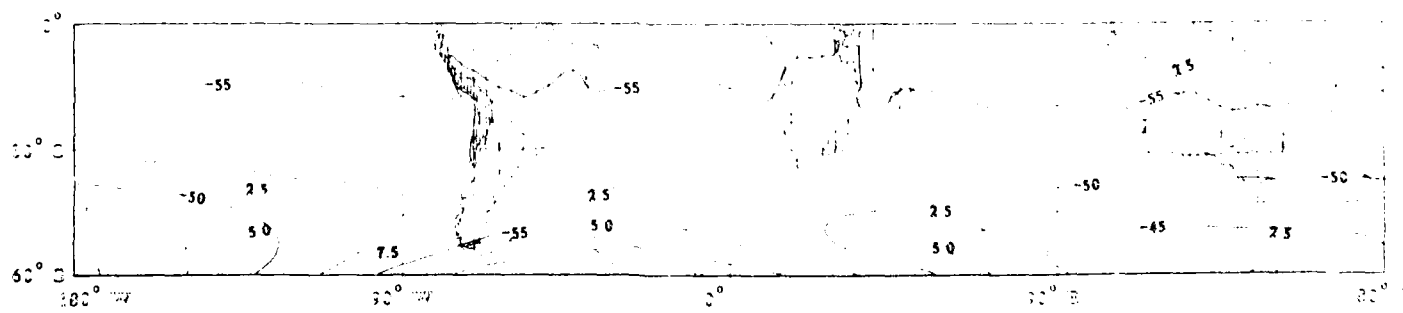
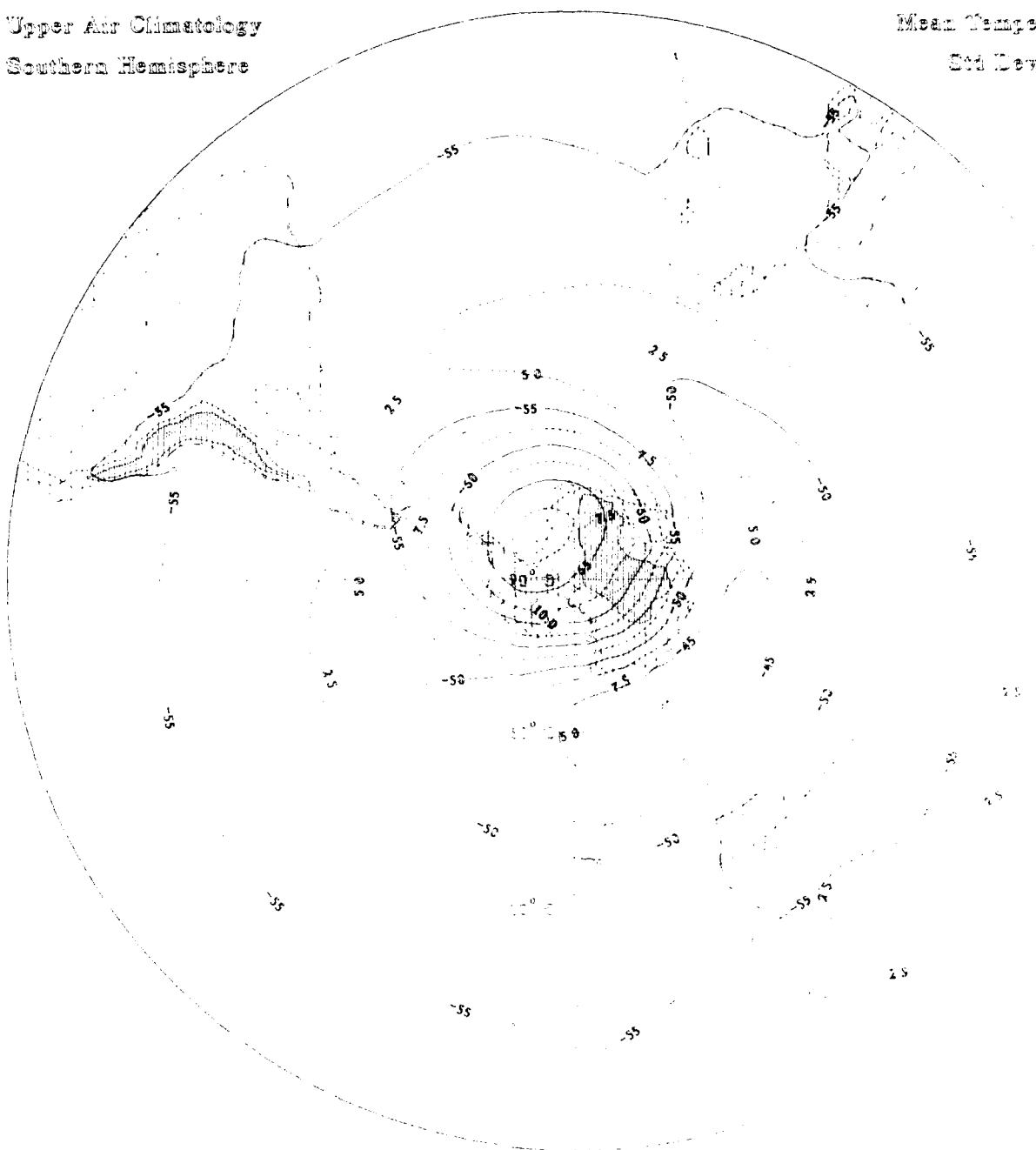
Upper Air Climatology
Southern Hemisphere

Mean Temperature (°C)

Sea Level (Contour)

Contour

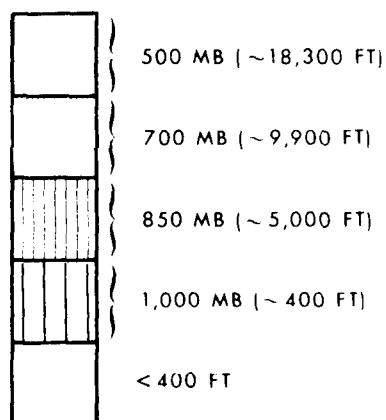
1°C



DEW POINT
(6 LEVELS, 1000 TO 300 MB)

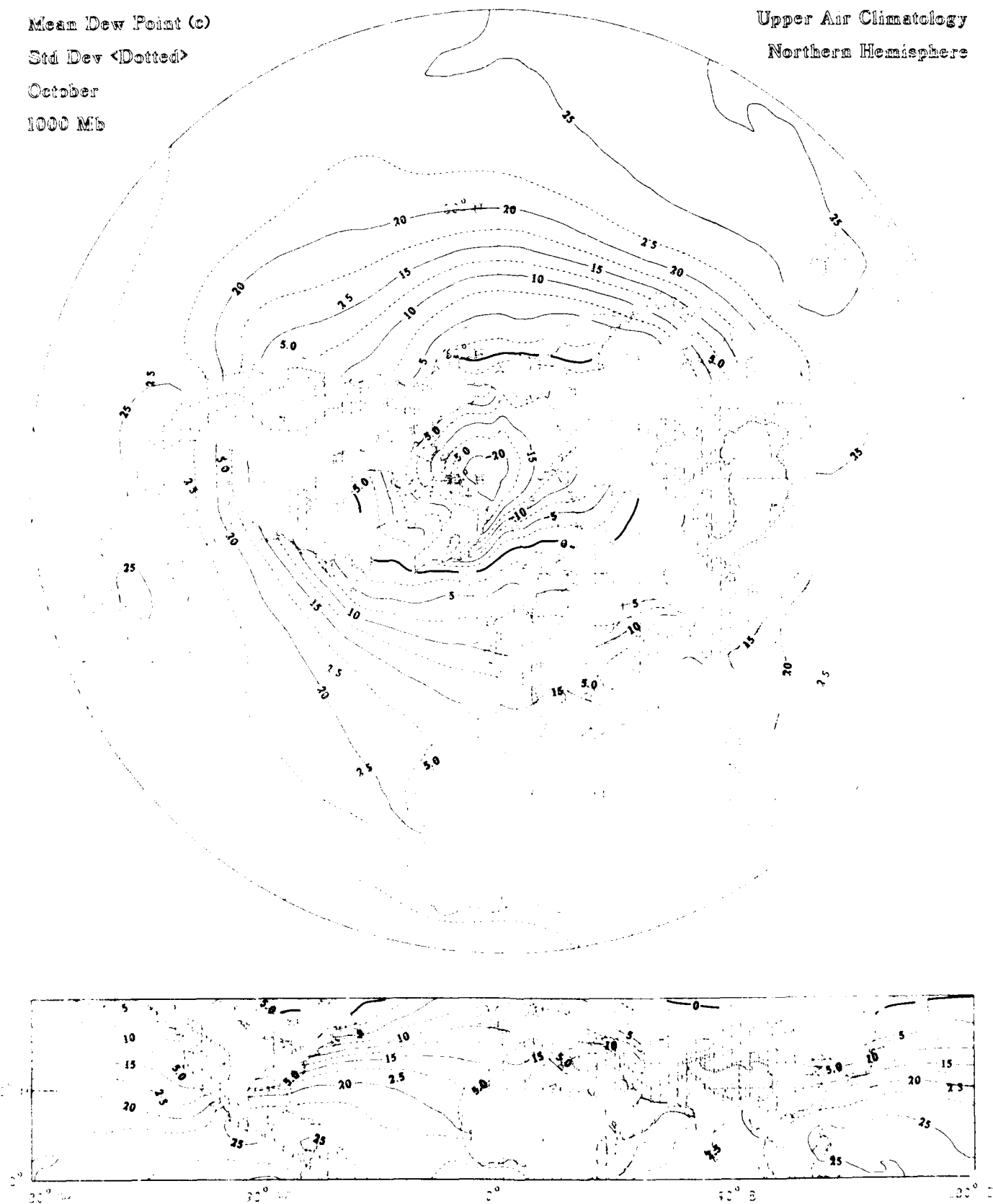
- Contours of mean dew point (solid and dashed lines) in °C: solids labeled, dashed intermediates unlabeled.
- Dew point labeled interval: 5°C
- Contours of standard deviation of dew point (dotted lines) in °C
- Standard deviation of dew point labeled interval: 2.5°C
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



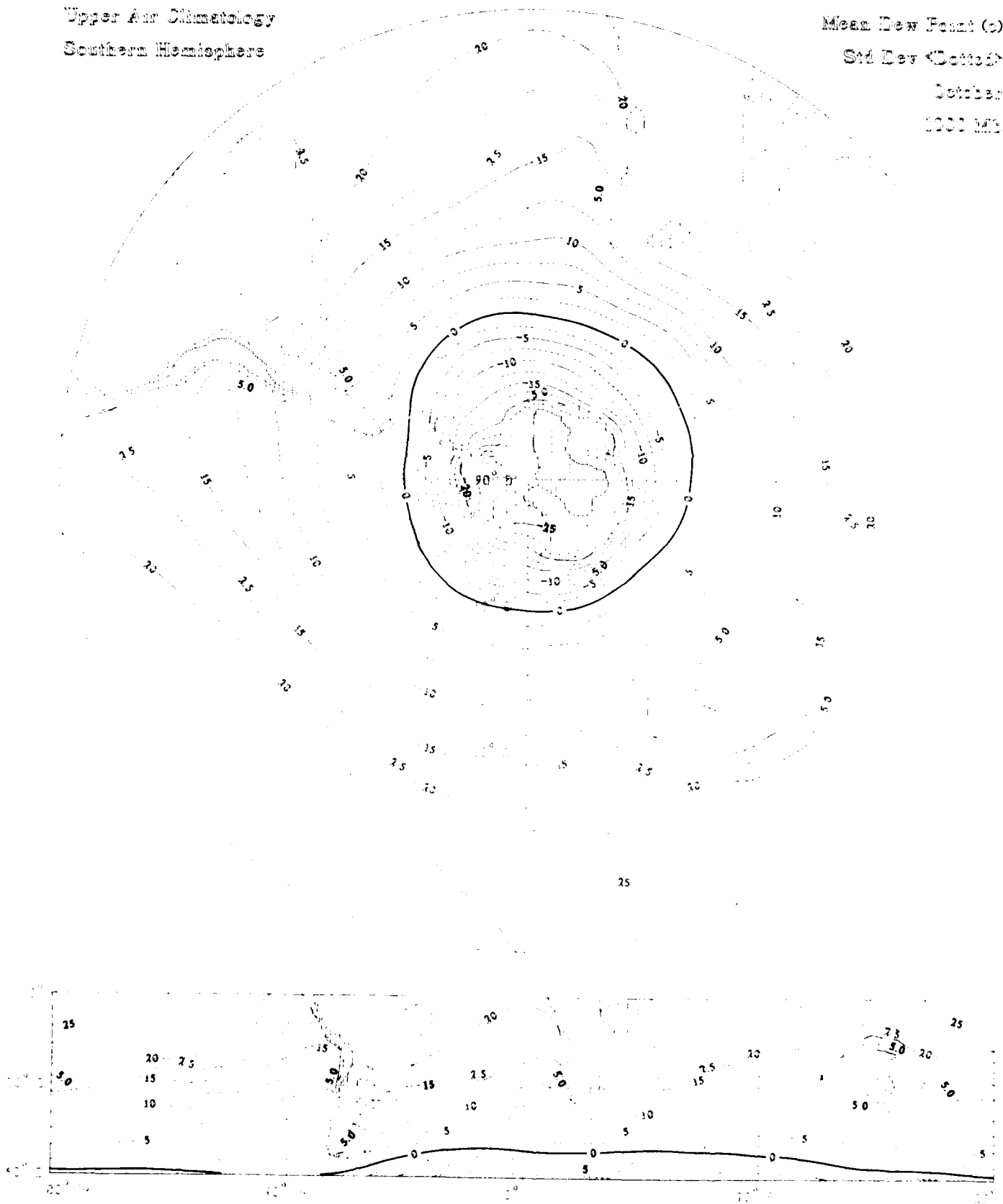
Mean Dew Point (c)
 Std Dev <Dotted>
 October
 1000 Mb

Upper Air Climatology
 Northern Hemisphere



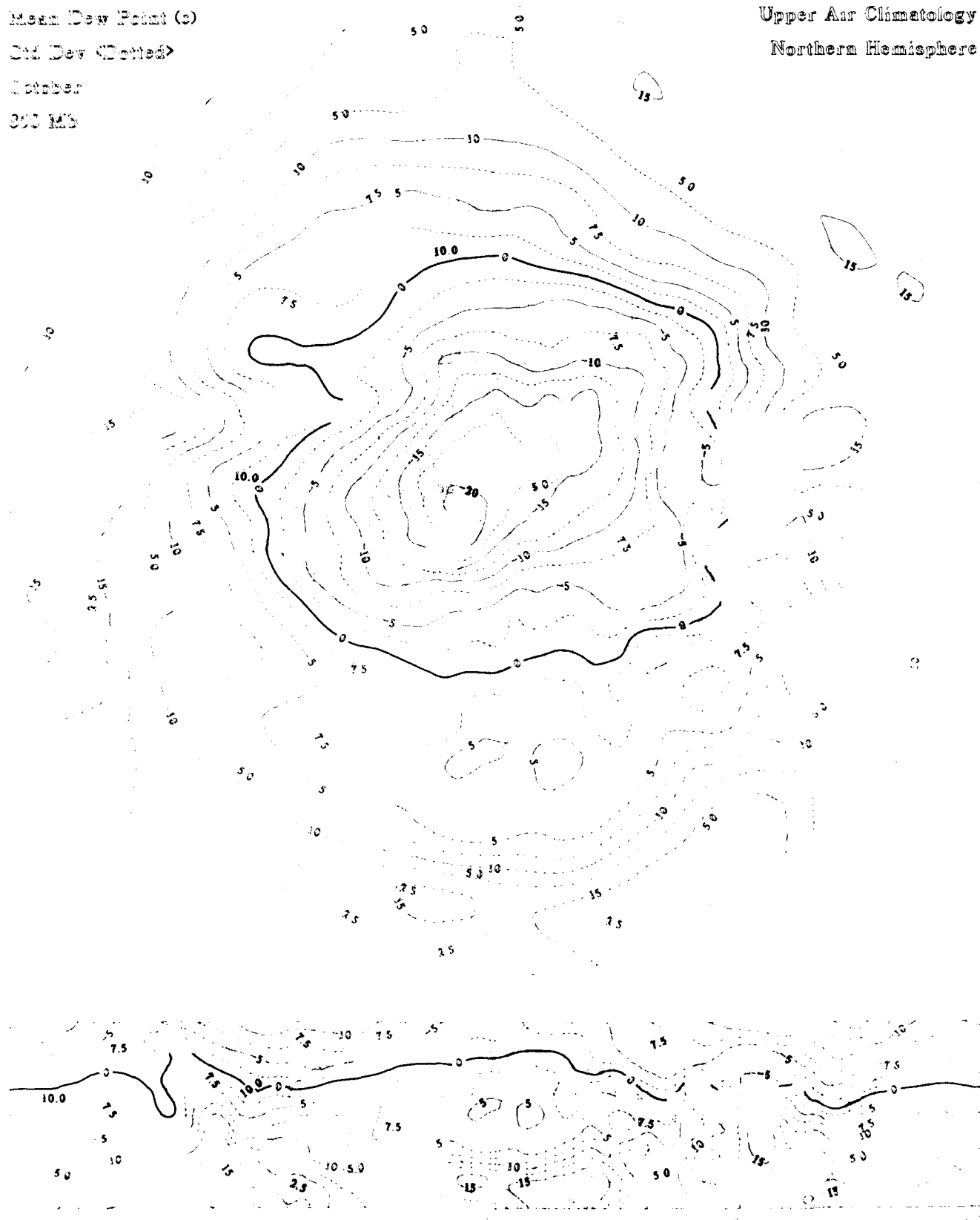
Upper Air Climatology
Southern Hemisphere

Mean Dew Point (°)
Std Dev (Cmbs)
October
1961-1962



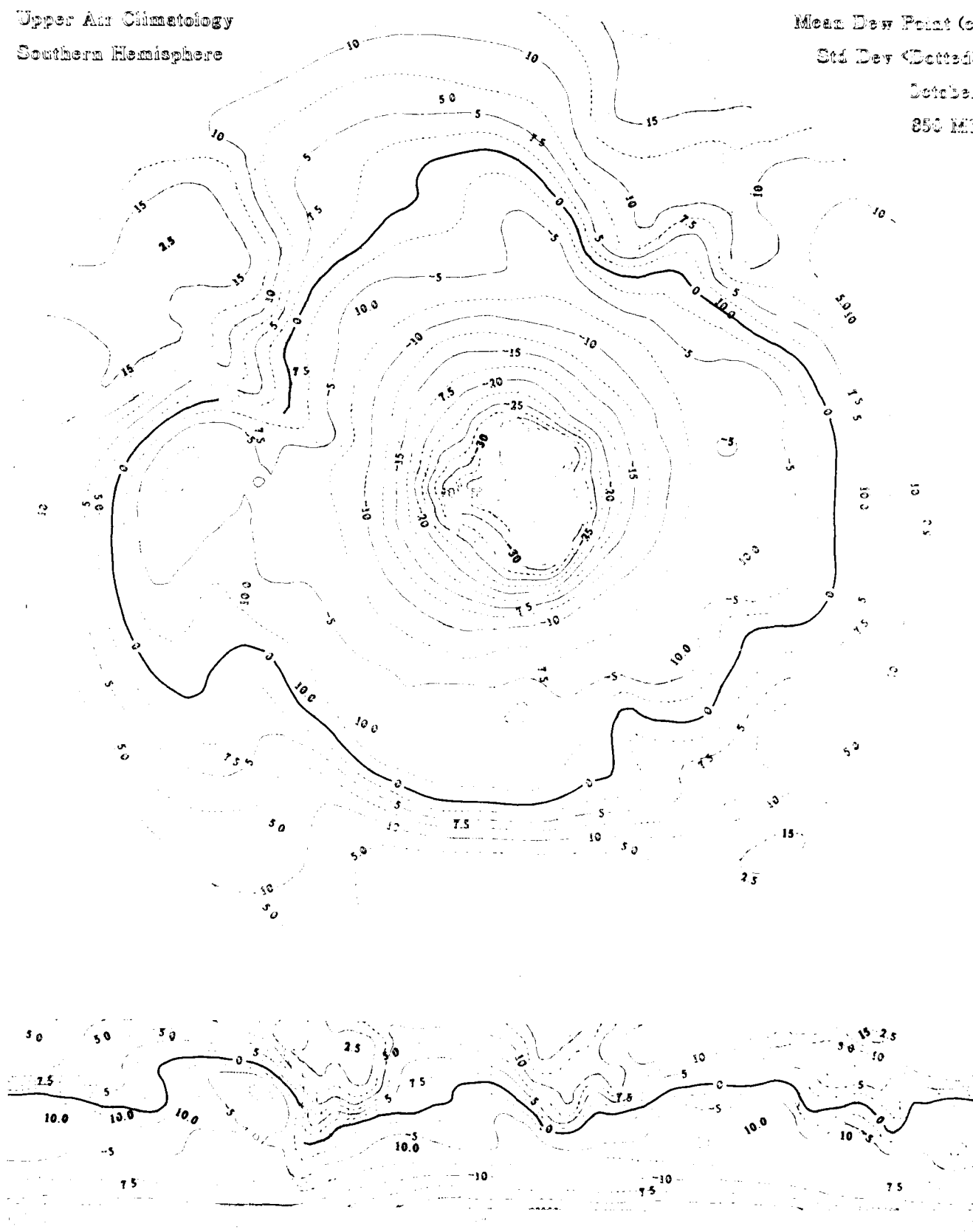
Mean Dew Point (c)
Std Dev (Dotted)
October
300 MB

Upper Air Climatology
Northern Hemisphere



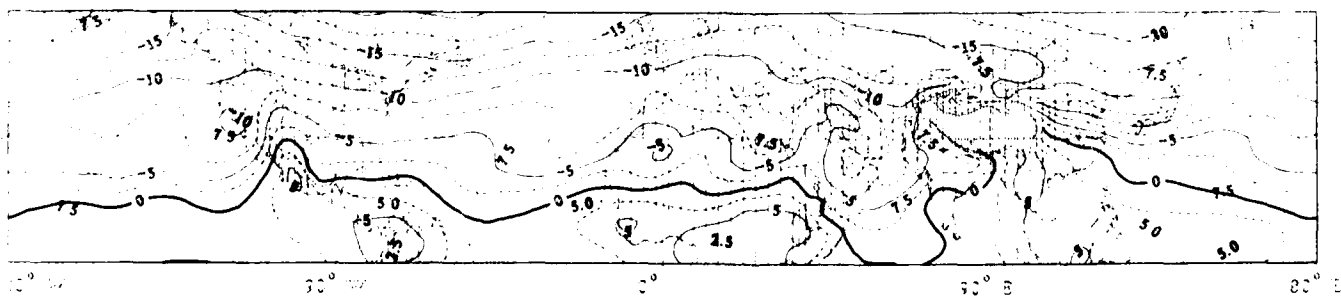
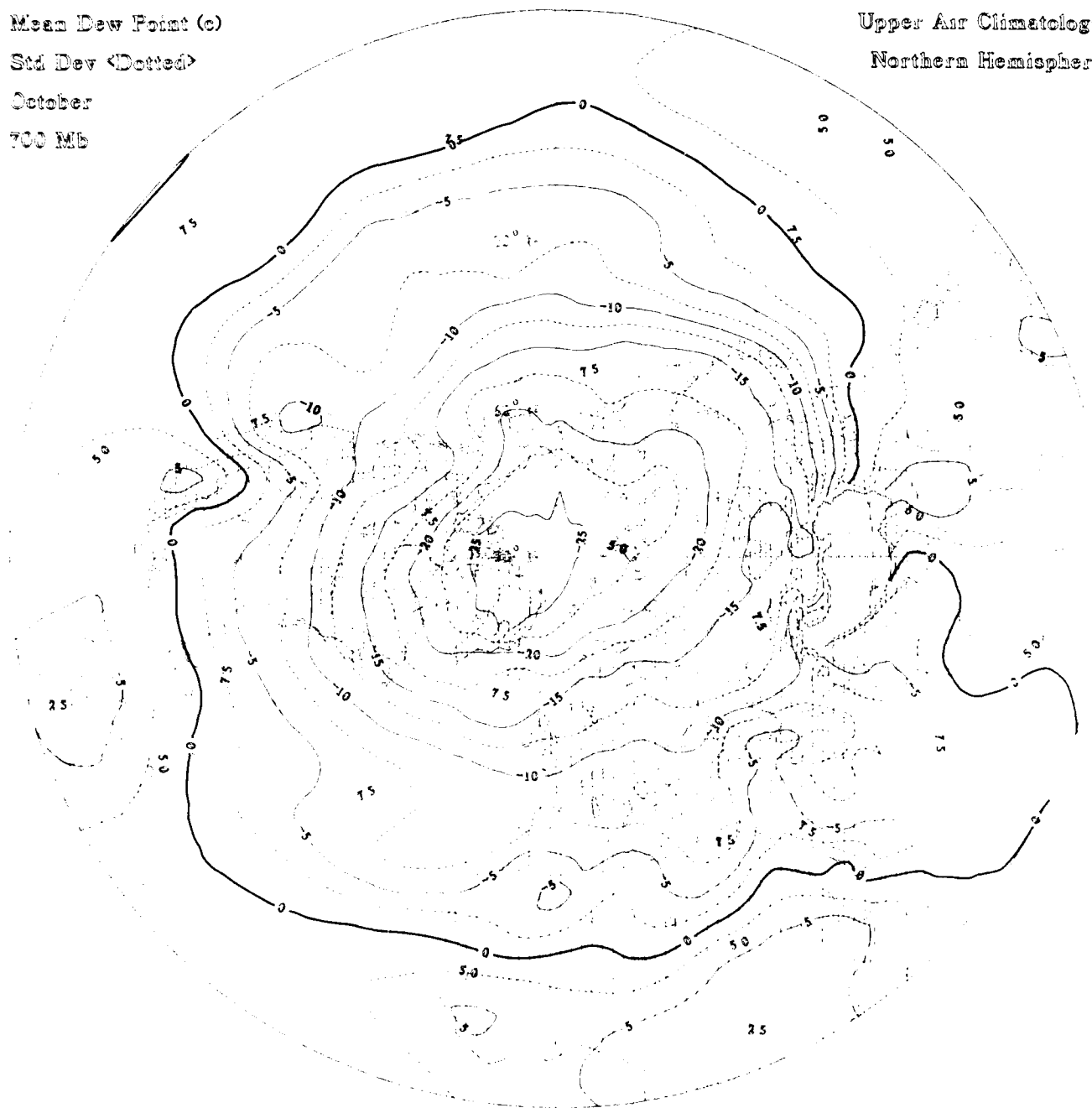
Upper Air Climatology
Southern Hemisphere

Mean Dew Point (c)
Std Dev <Dotted>
October
850 MB



Mean Dew Point (c)
Std Dev (Dotted)
October
700 Mb

Upper Air Climatology
Northern Hemisphere



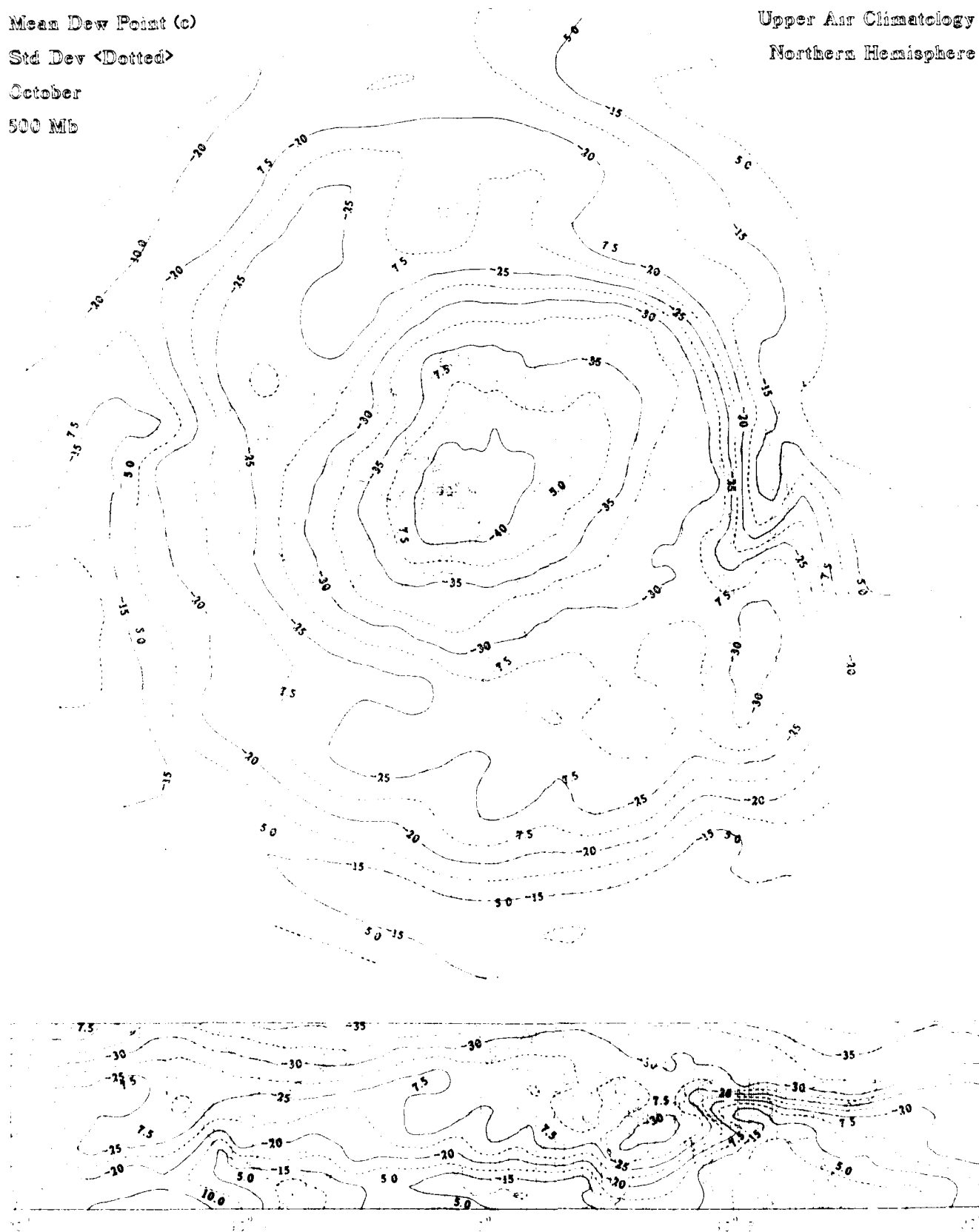
Upper Air Climatology
Southern Hemisphere

Mean Dew Point (c)
Std Dev <Dotted>
October
700 Mb



Mean Dew Point (c)
Std Dev <Dotted>
October
500 Mb

Upper Air Climatology
Northern Hemisphere



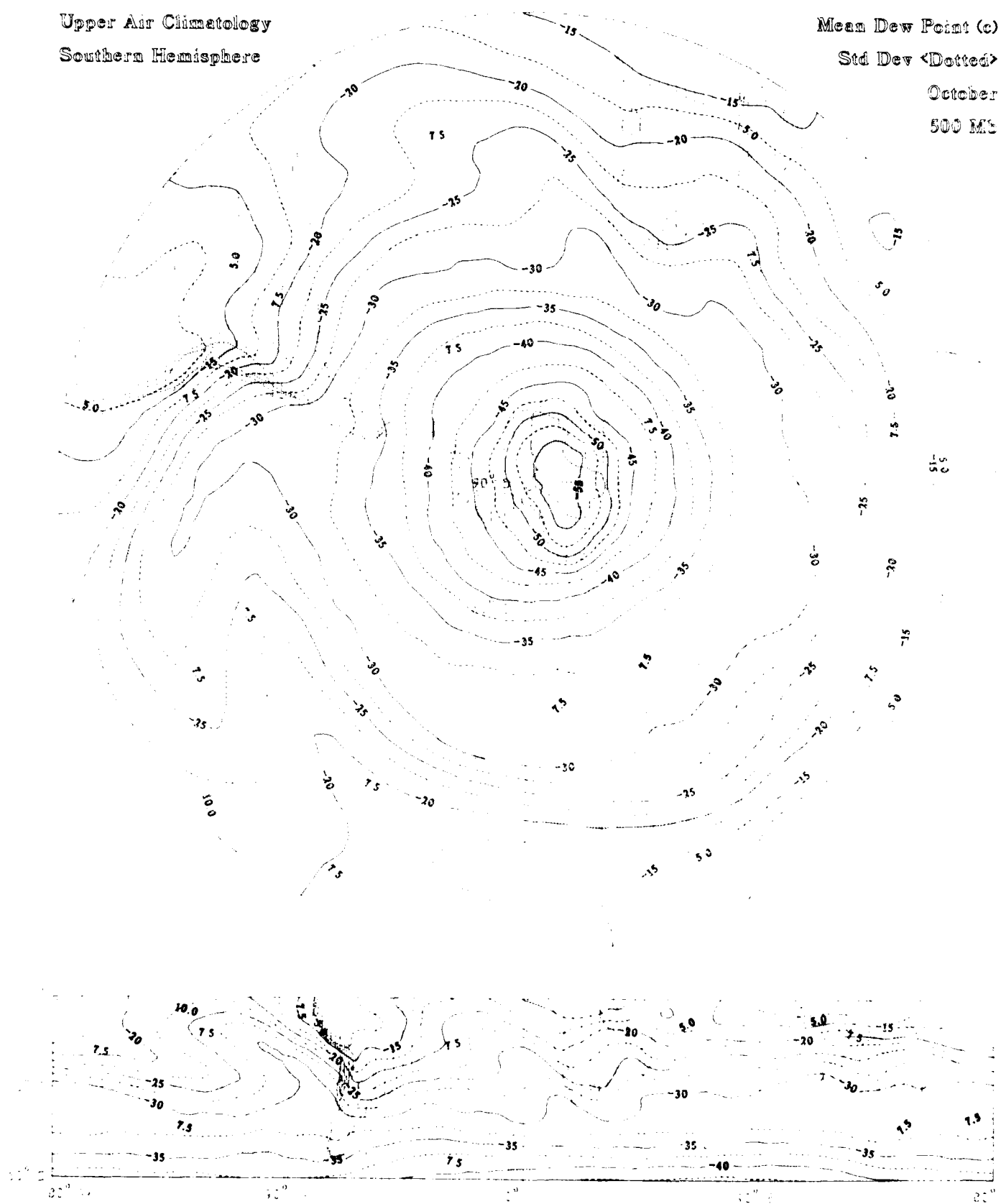
Upper Air Climatology
Southern Hemisphere

Mean Dew Point (c)

Std Dev <Dotted>

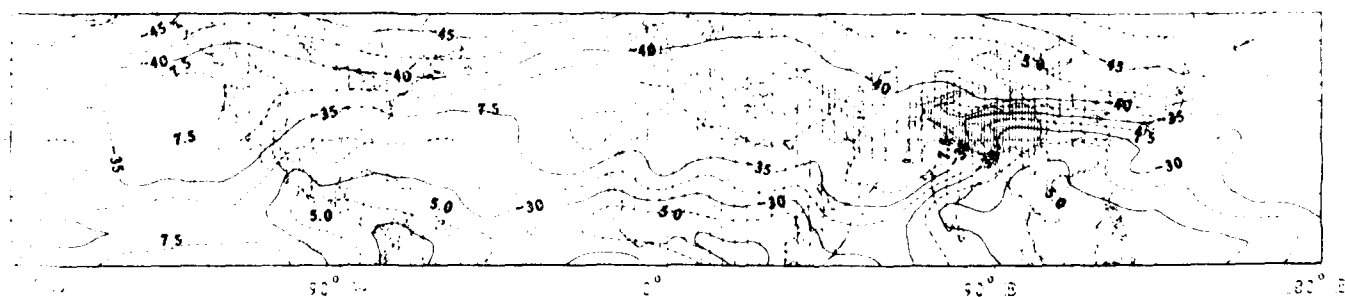
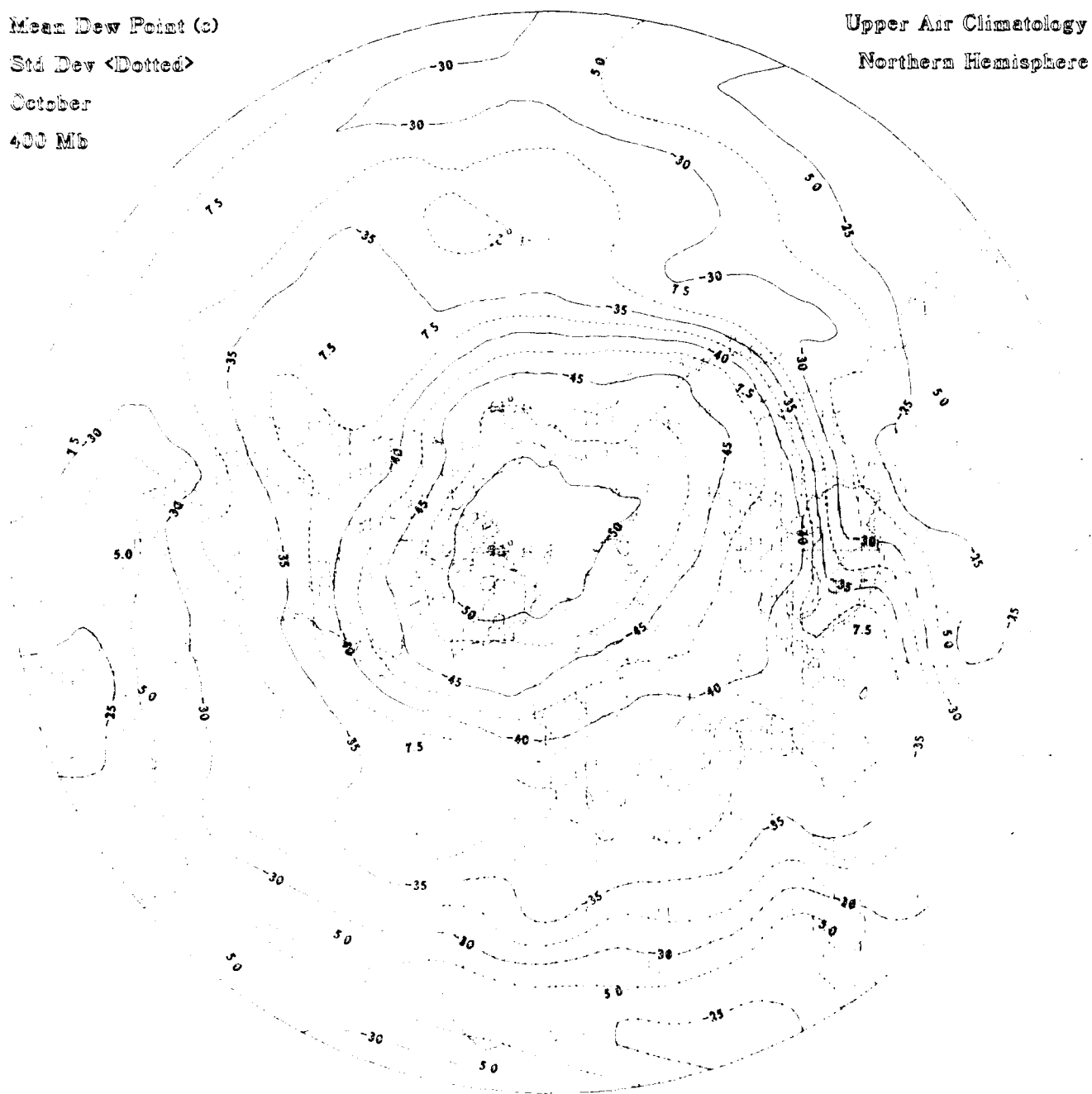
October

500 MB



Mean Dew Point (c)
 Std Dev <Dotted>
 October
 400 Mb

Upper Air Climatology
 Northern Hemisphere



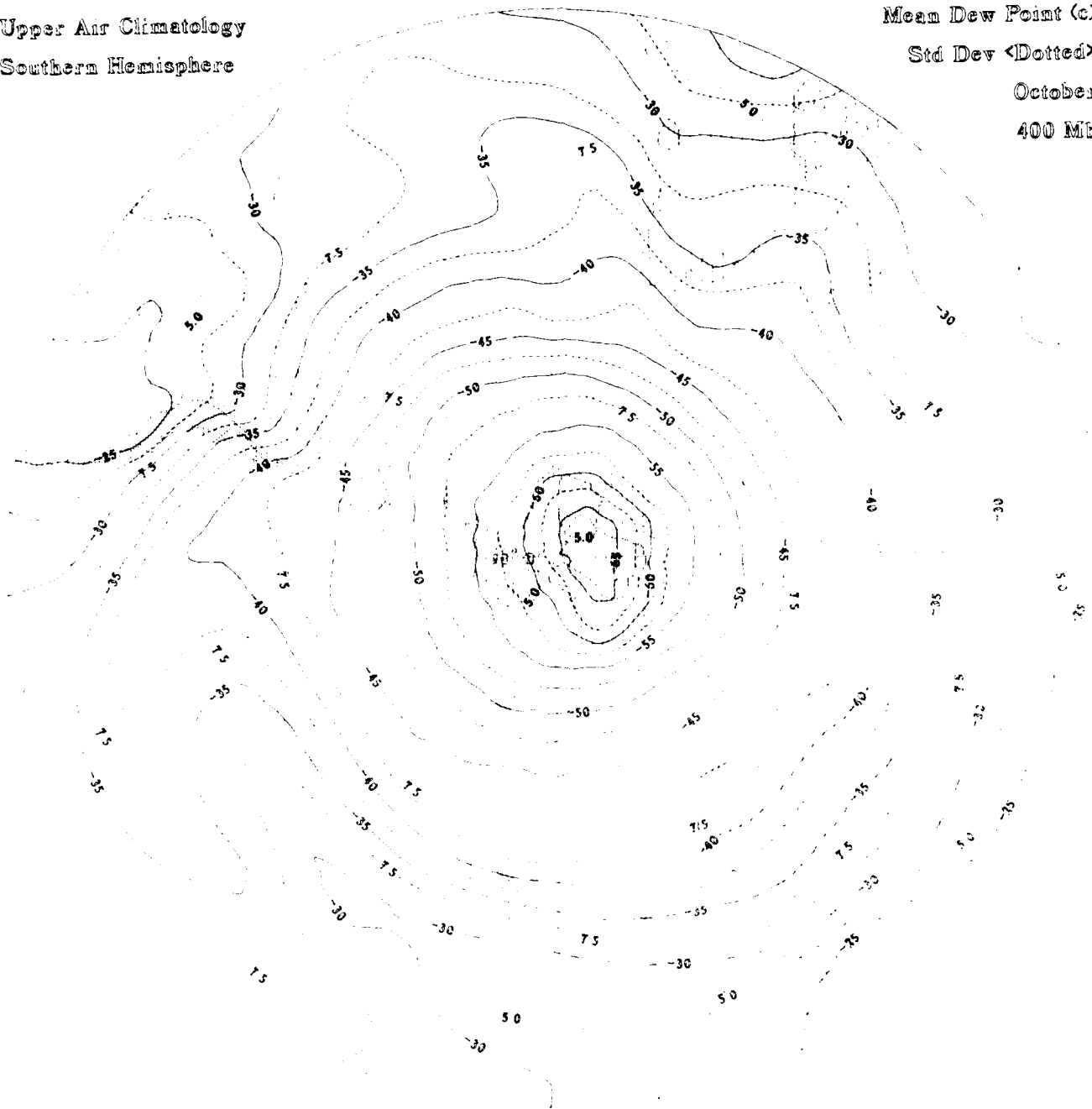
Upper Air Climatology
Southern Hemisphere

Mean Dew Point (c)

Std Dev <Dotted>

October

400 Mb



Mean Dew Point (C)

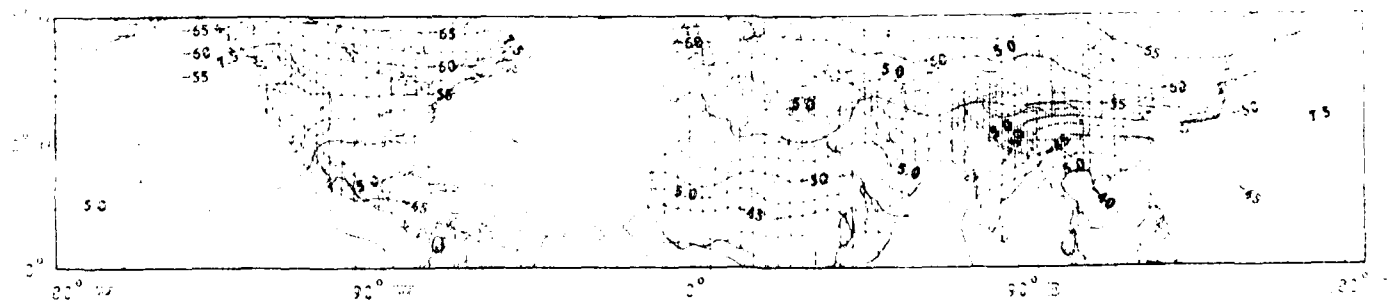
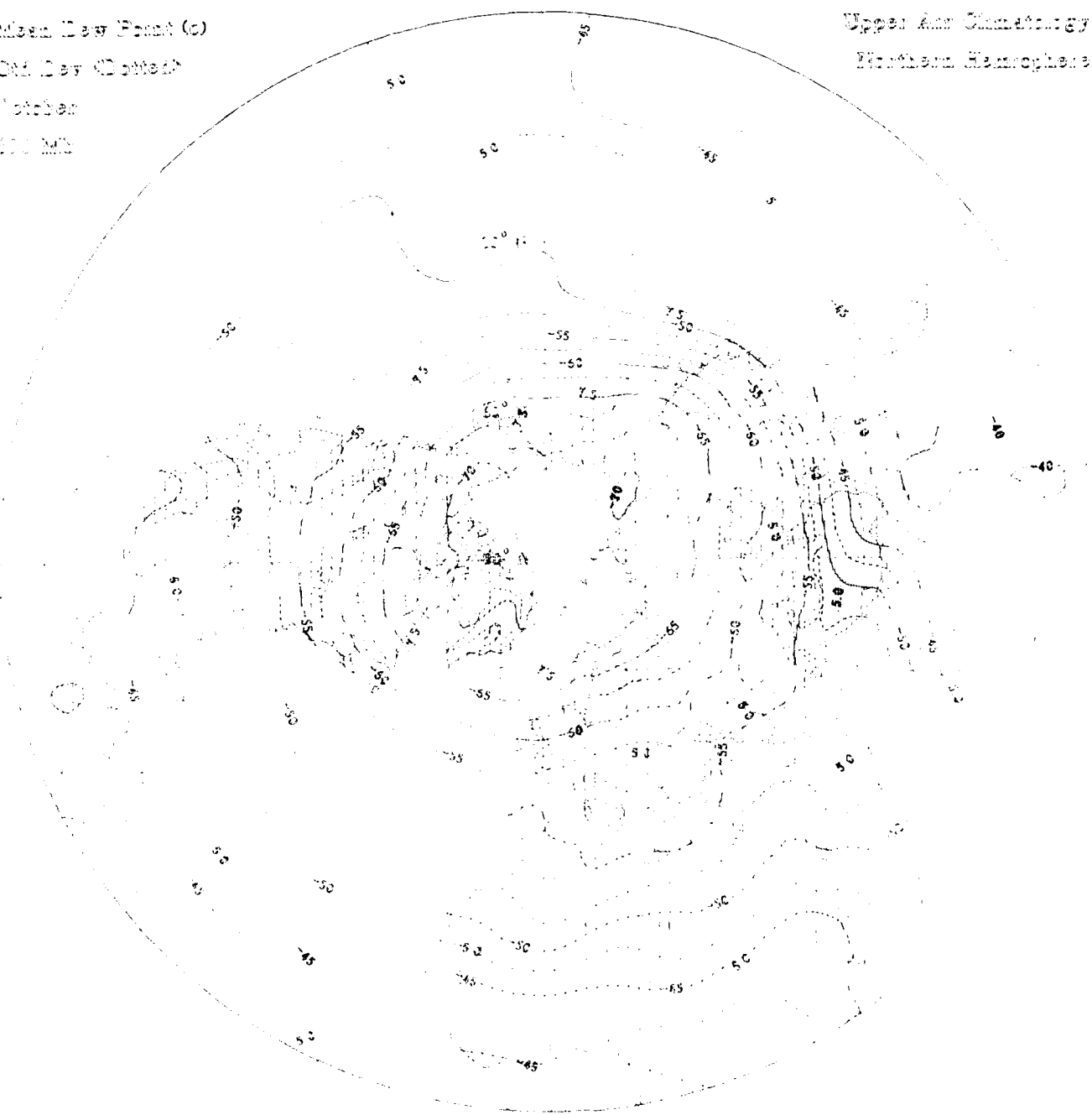
Jan. Day (Dotted)

Feb.

1960

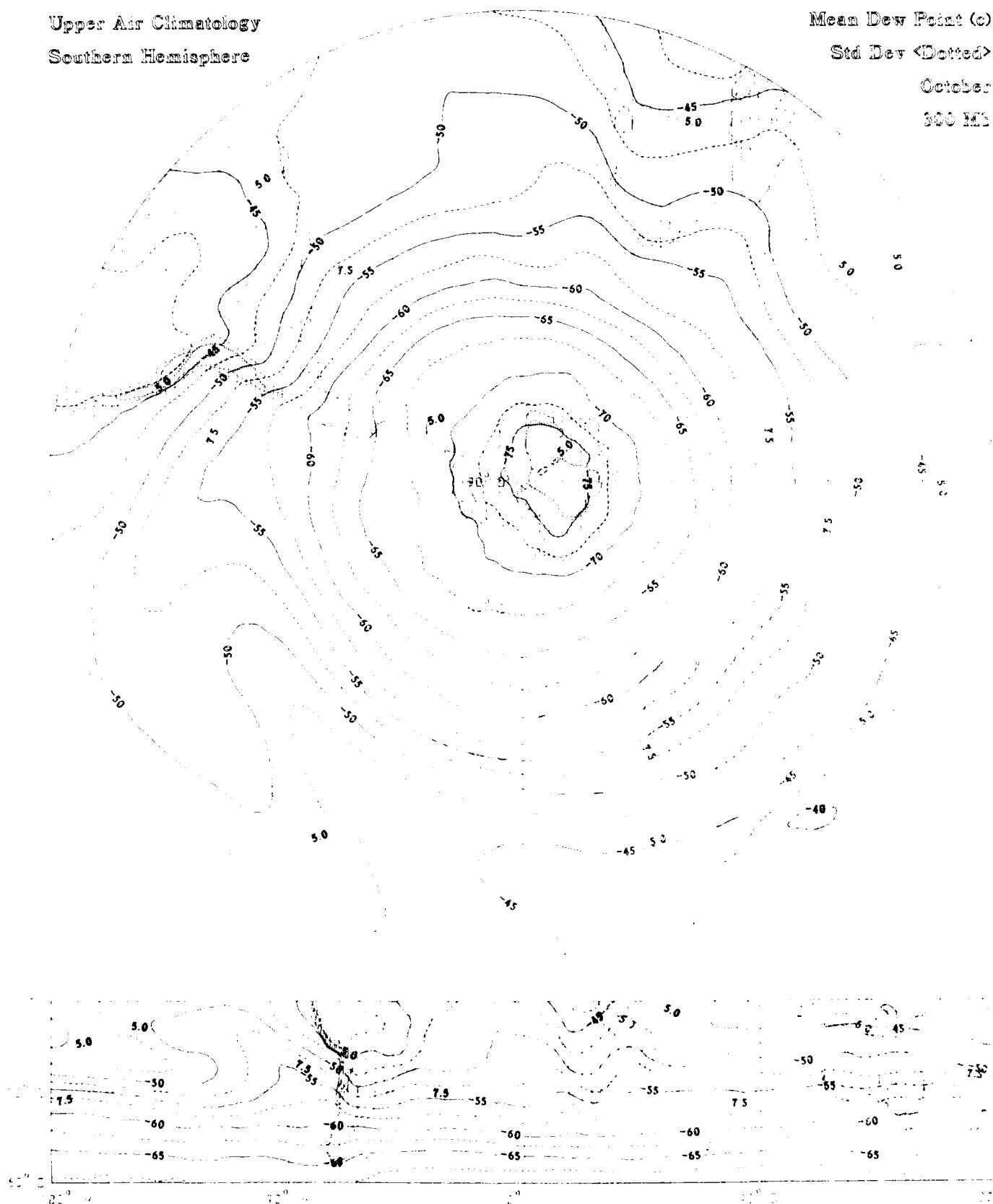
Upper Air Climatology

Western Hemisphere



Upper Air Climatology
Southern Hemisphere

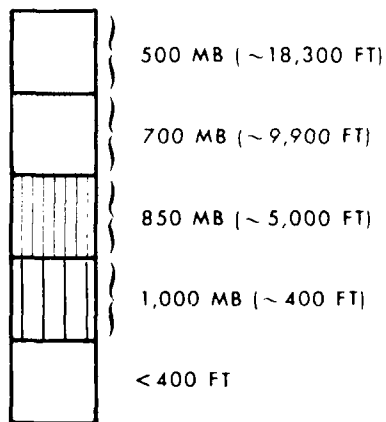
Mean Dew Point (c)
Std Dev <Dotted>
October
300 MB



DENSITY
(13 LEVELS, 1000 TO 30 MB)

- Contours of mean density (solid and dashed lines) in kilograms/cubic meter; solids labeled, dashed intermediates unlabeled
- Density labeled interval:
 - .02 kilograms/cubic meter - 1000 MB to 400 MB
 - .01 kilograms/cubic meter - 300 MB to 200 MB
 - .006 kilograms/cubic meter - 150 MB to 30 MB
- Contours of standard deviation of density (dotted lines) in kilograms/cubic meter
- Standard deviation of density labeled interval:
 - .01 kilograms/cubic meter - 1000 MB to 400 MB
 - .005 kilograms/cubic meter - 300 MB to 200 MB
 - .003 kilograms/cubic meter - 150 MB to 30 MB
- Contours blanked for geographic areas with elevations exceeding specific geopotential heights

ELEVATION SCALE

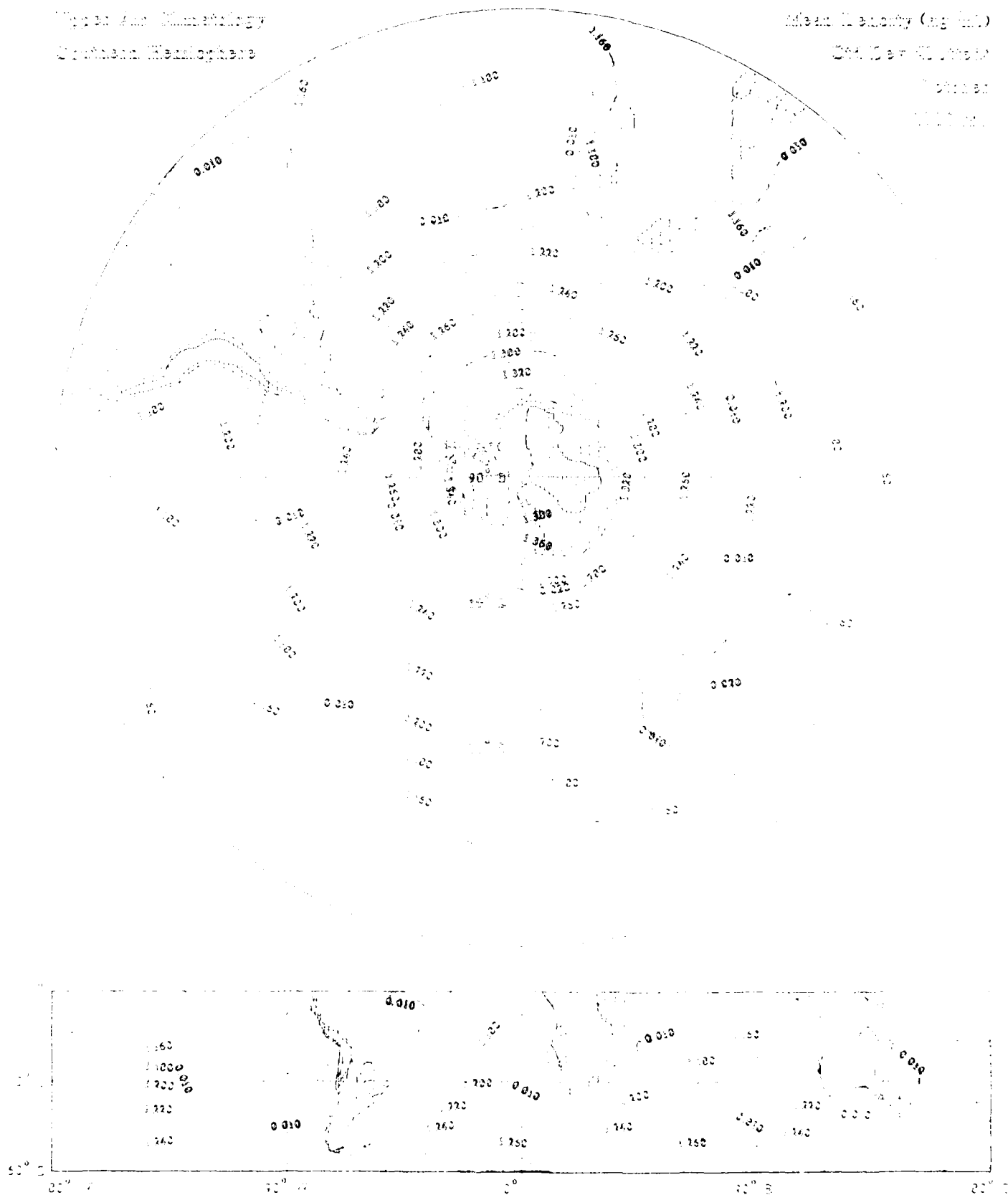


Joseph Lee Rosenberg

November 20, 1969



African Geography (ing. tit.)
 October 1990
 1990



Mean Value (mg/l)

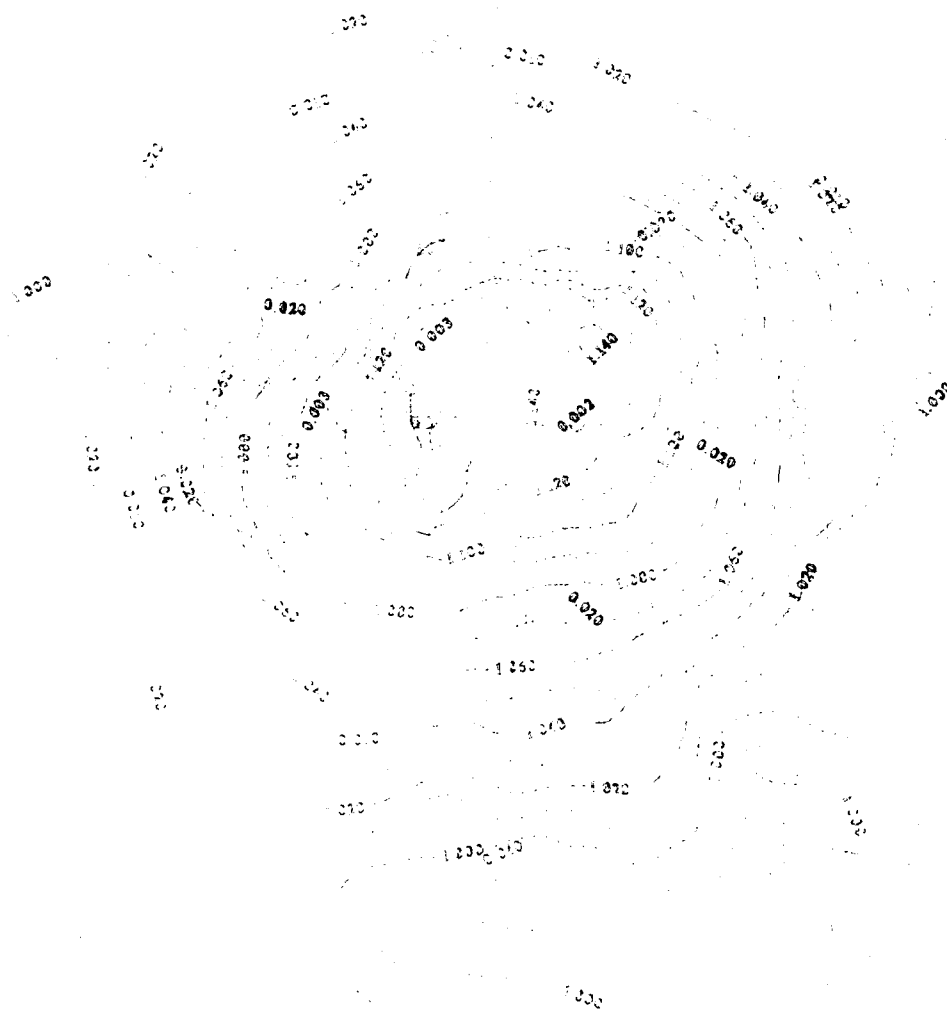
Unit: mg/l

100

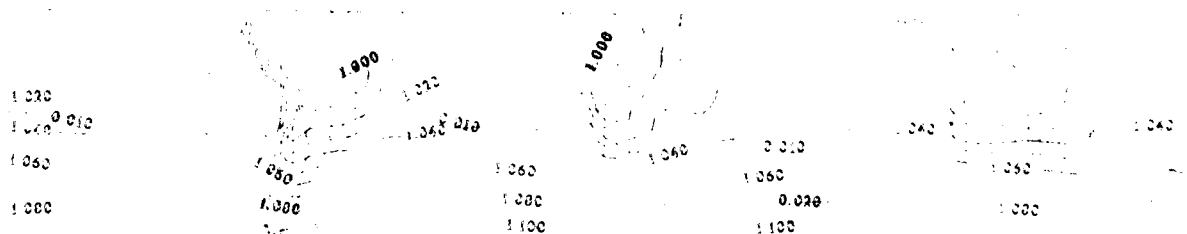
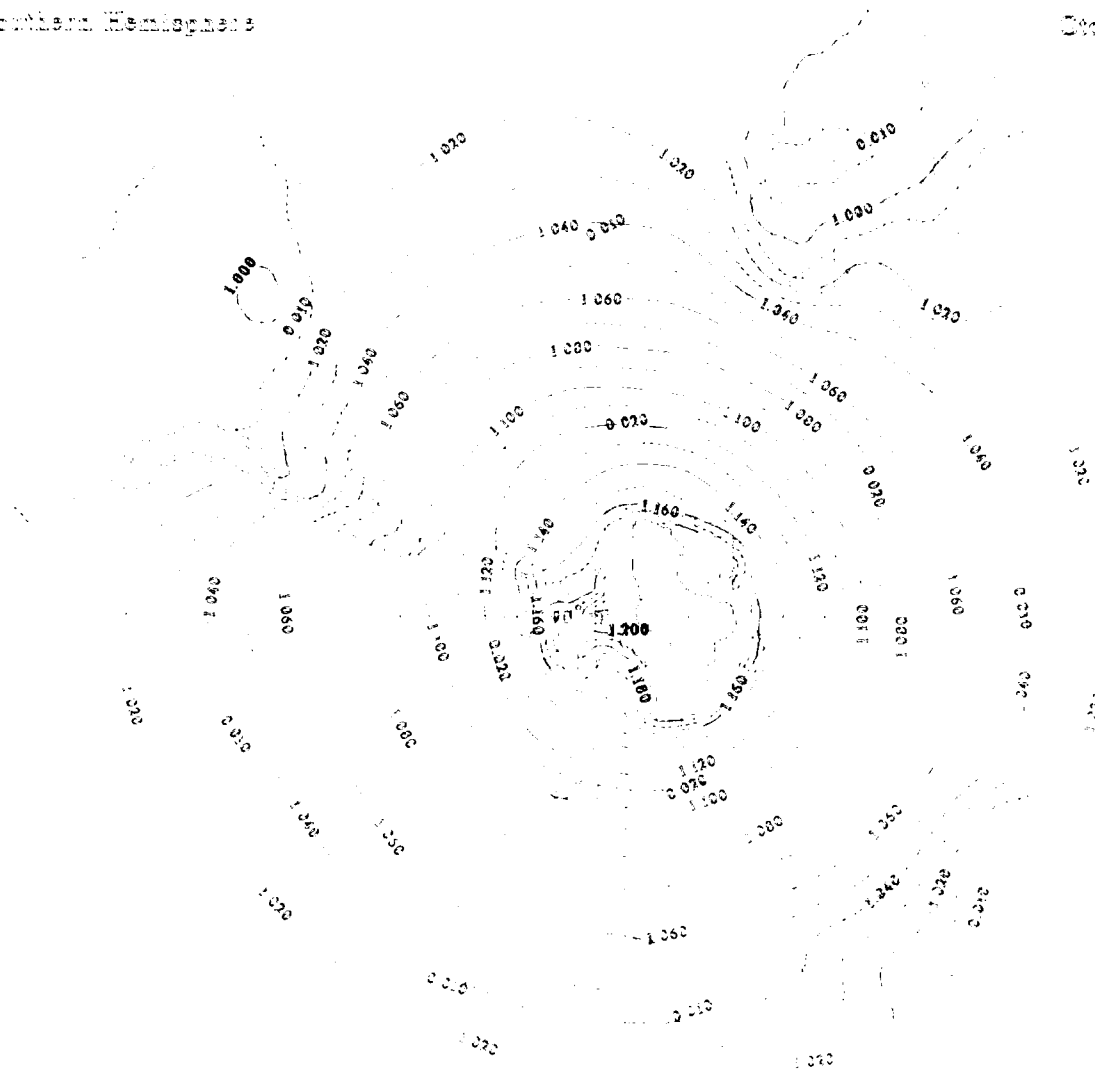
200

Topographic Contouring

Topographic Contouring



351 442



Mean Density (kg/m³)

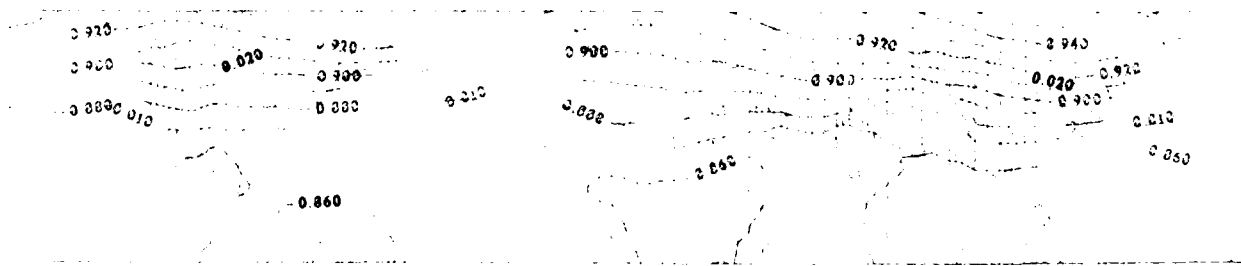
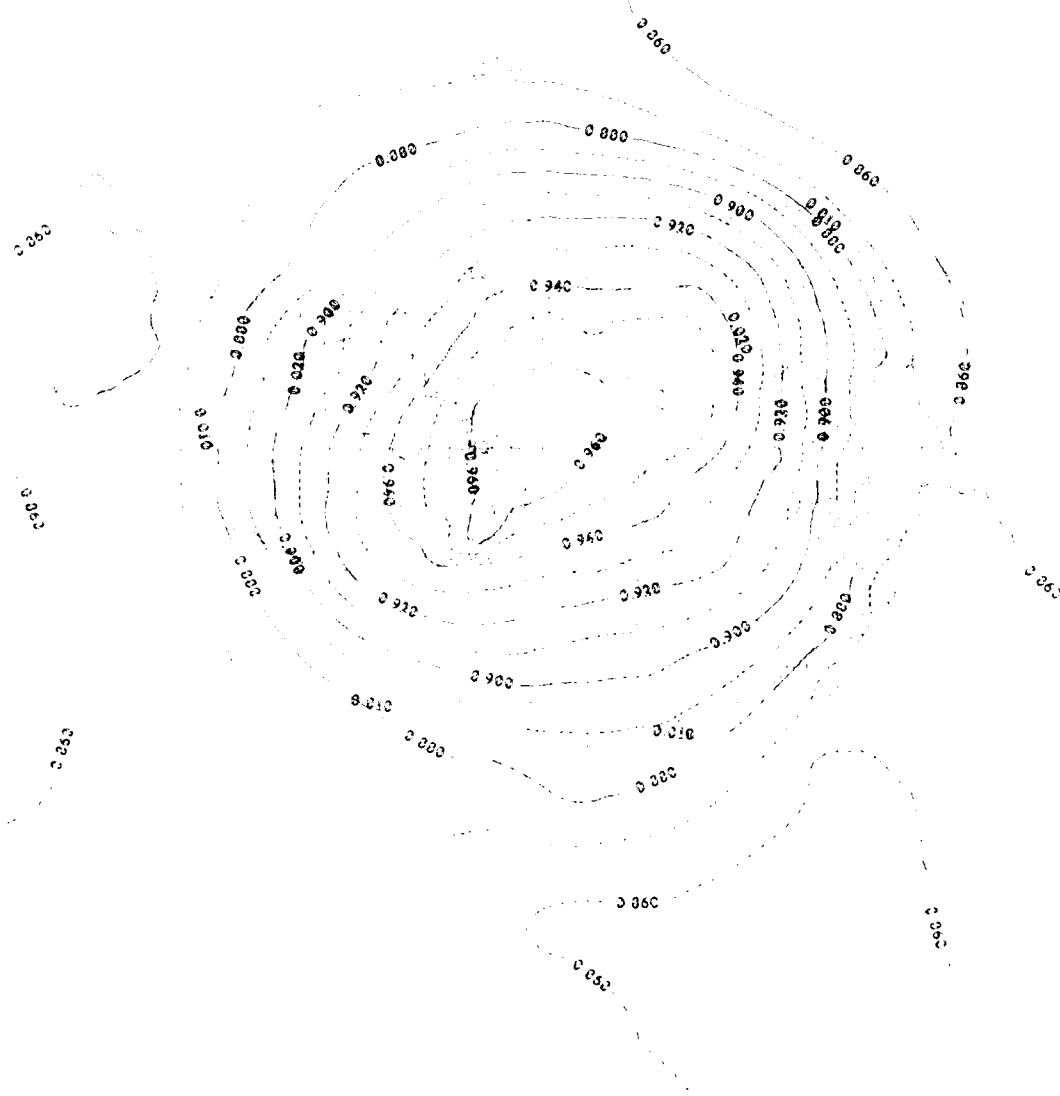
Sea Level (Dated)

1958

1959

Upper Air Density

Northern Hemisphere



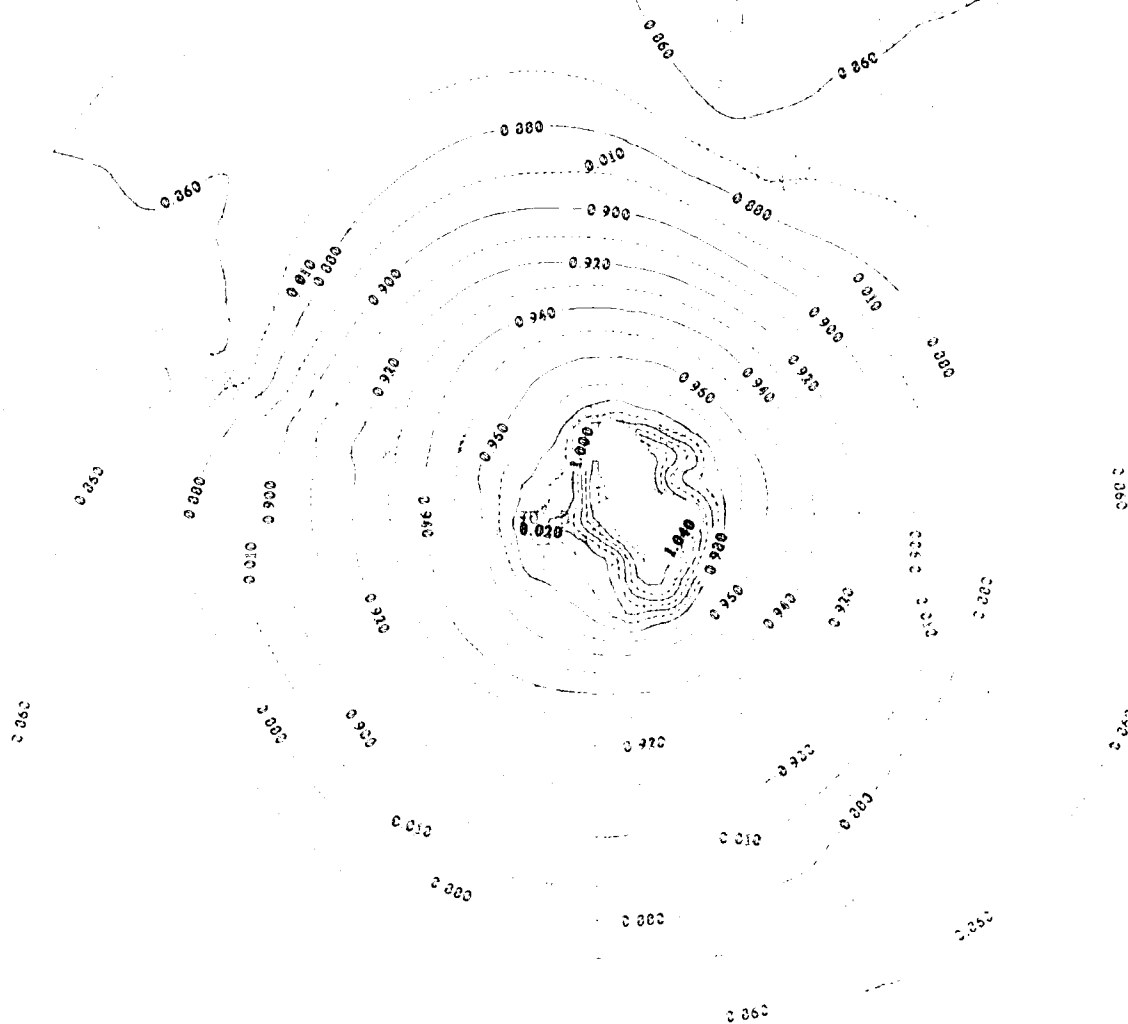
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

Std Dev <Data>

Station

1951-52



0.000
0.001
0.002

0.000
0.001
0.002

0.000
0.001
0.002

0.000
0.001
0.002

0.000
0.001
0.002

Std. Dev. < 0.010

Mean Density (kg/m³)

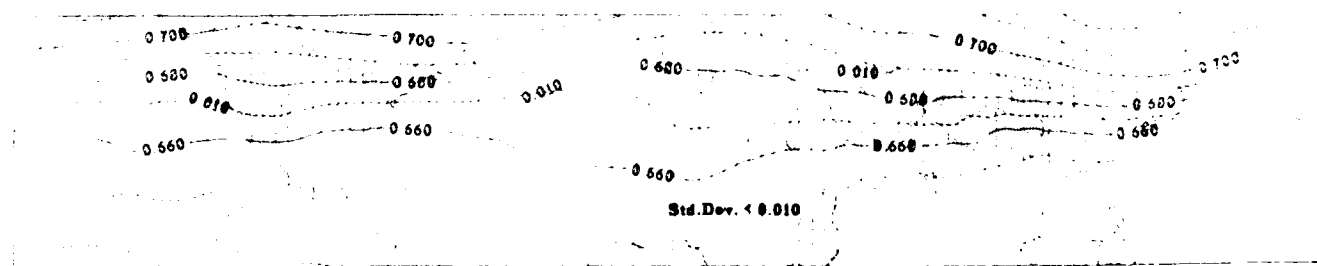
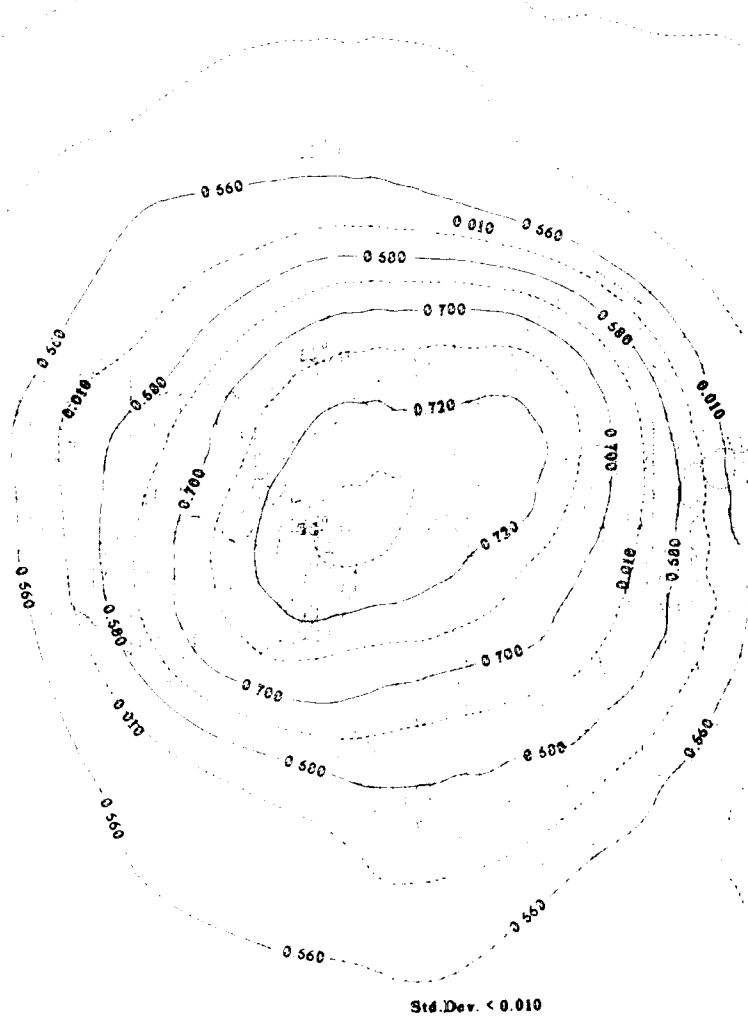
Std Dev (Dotted)

October

500 Mb

Upper Air Climatology

Northern Hemisphere



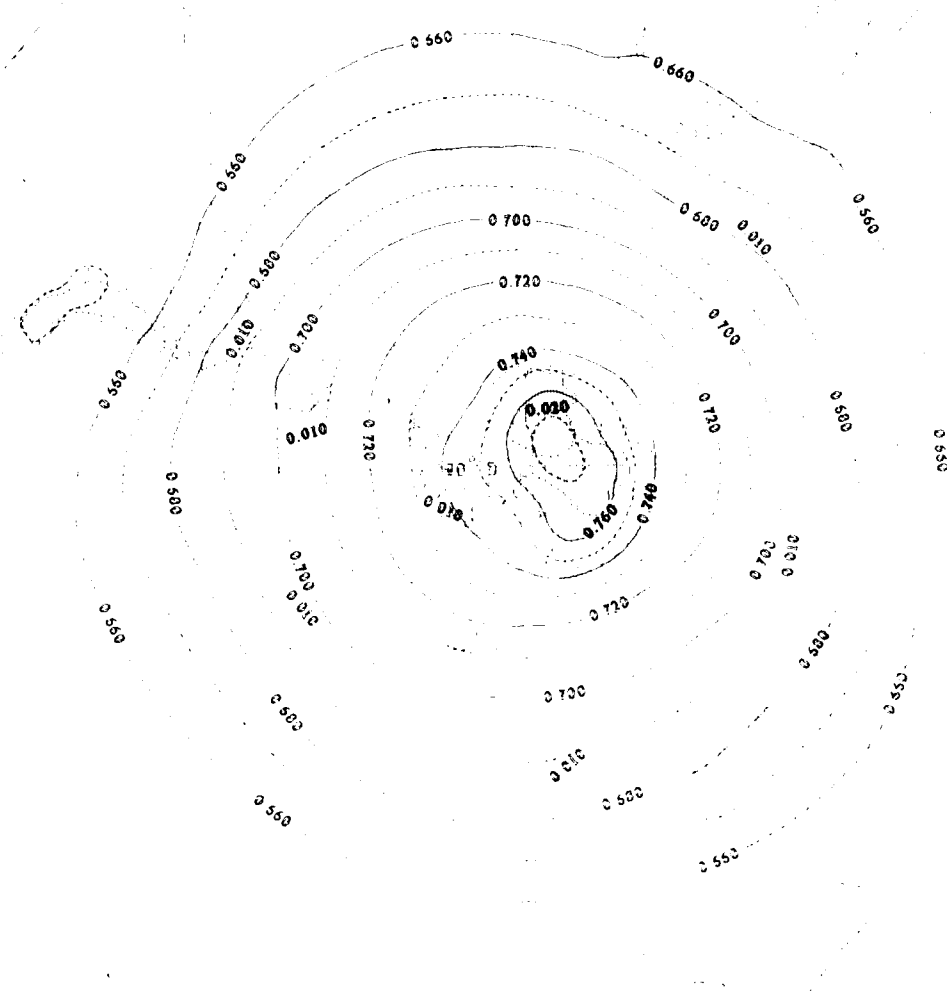
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

Std Dev <Dotted>

October

500 MB



Std. Dev. < 0.010

0.560
0.580
0.600
0.620

0.560
0.580
0.600
0.620
0.640

0.560
0.580
0.600
0.620
0.640

0.560
0.580
0.600
0.620
0.640

0.560
0.580
0.600
0.620
0.640

Mean Density (kg/m³)

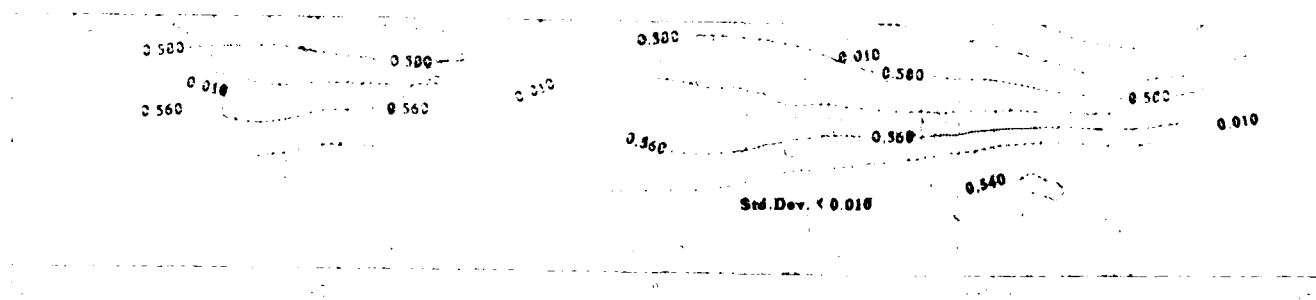
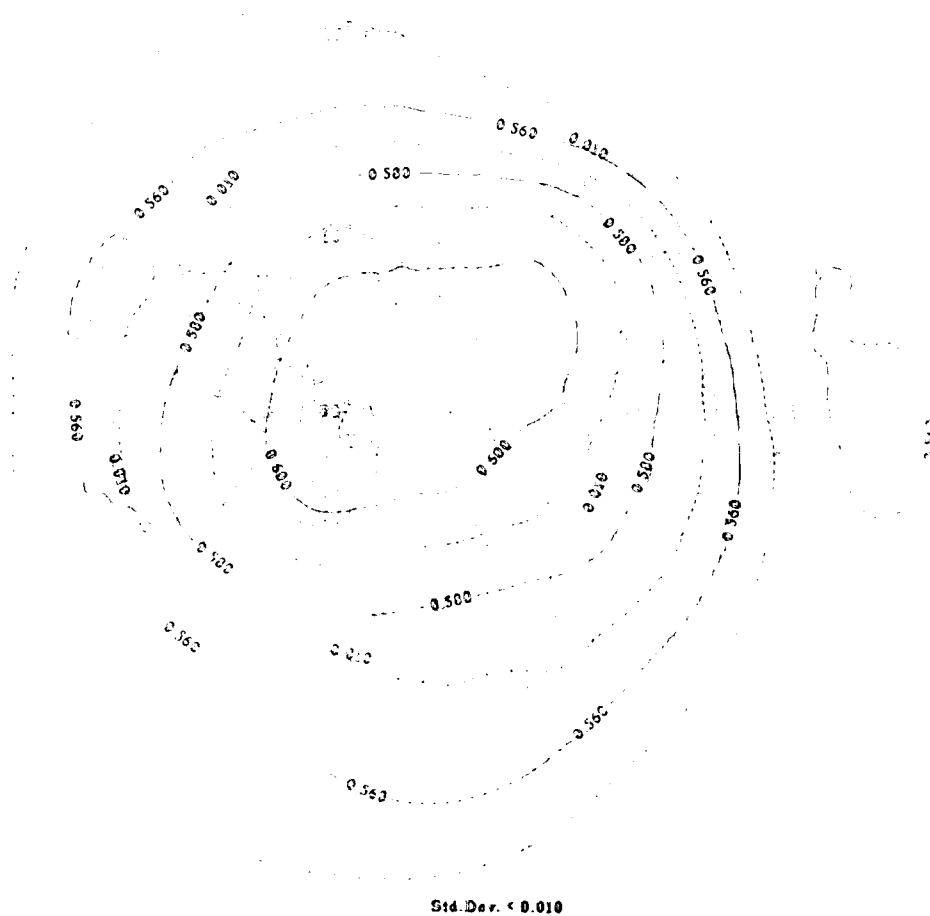
Std. Dev. (kg/m³)

Location

400 M

Upper Air Climatology

Horizontal Homogeneity

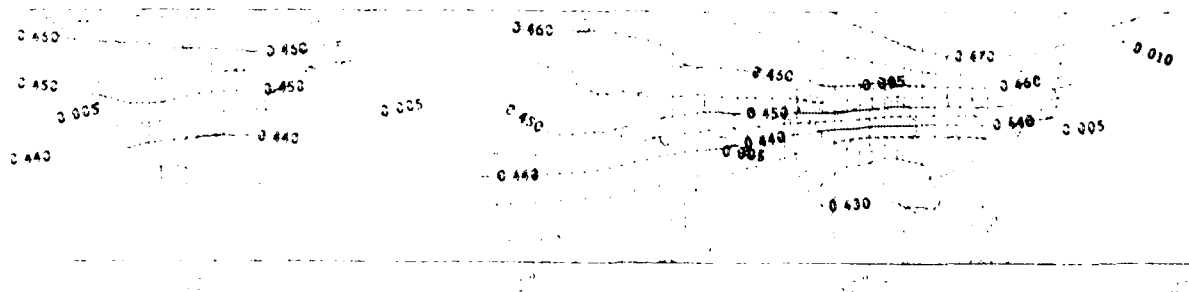
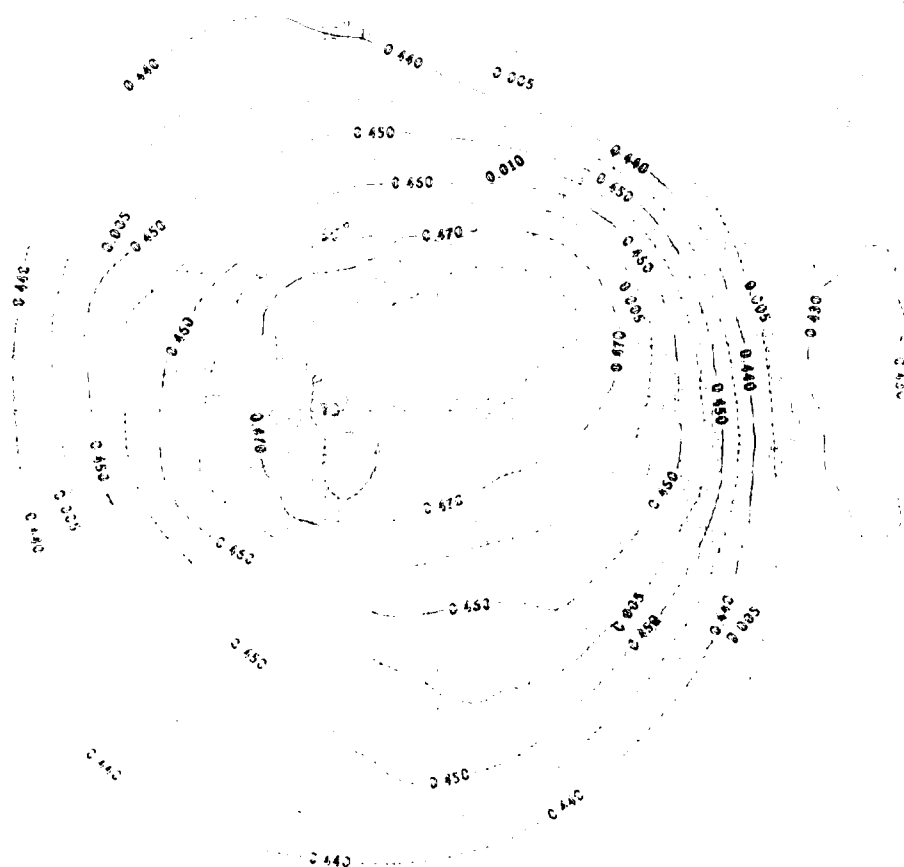


1. *Chlorophyll *a** and *Chlorophyll *b** were determined by the method of Arar and Collins (1971) using a Shimadzu 1601 UV-Visible Spectrophotometer.

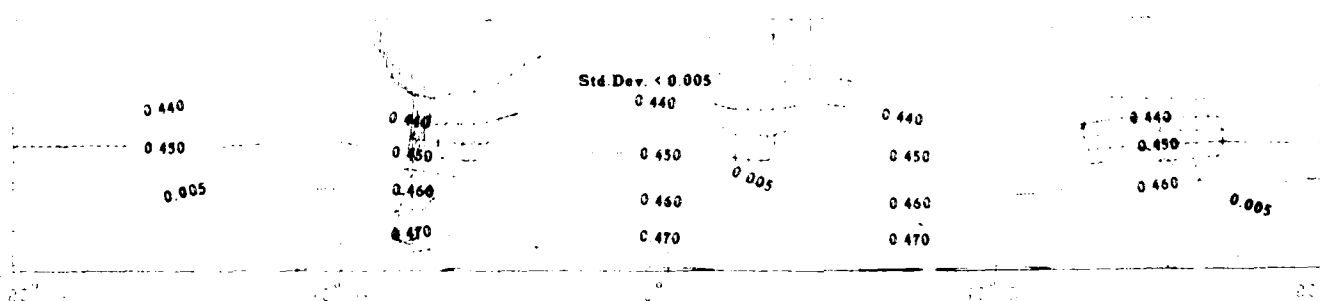
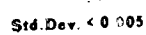


Figure 1

Northern Hemisphere



300 MB



Mean Density (kg/m³)

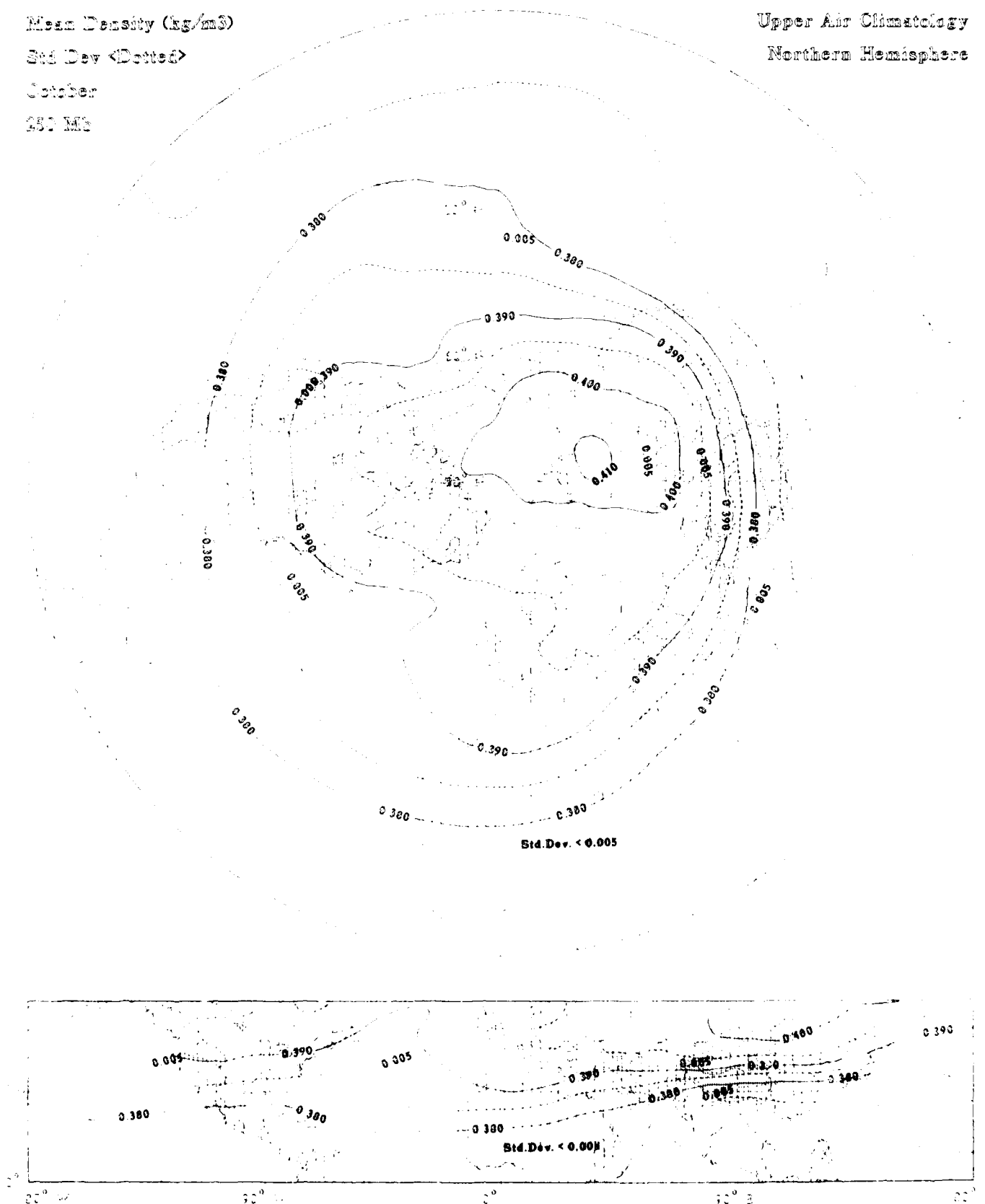
Std Dev <Dotted>

October

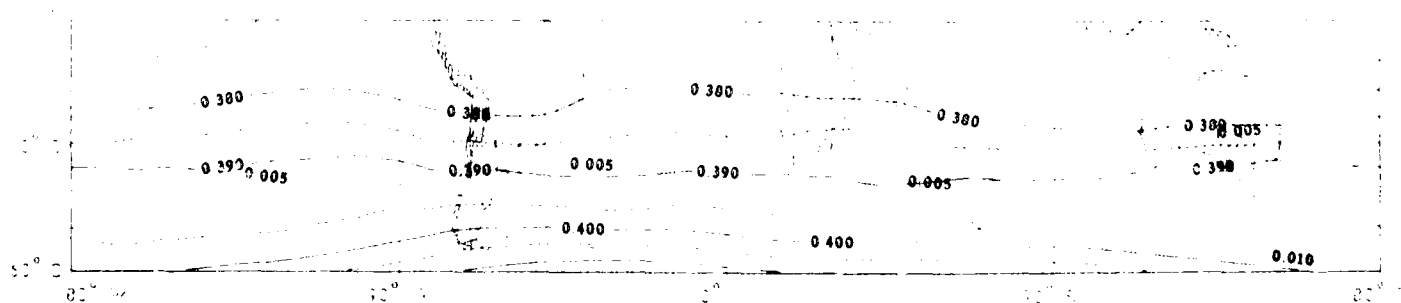
850 Mb

Upper Air Climatology

Northern Hemisphere



25. 12



Mean Density (kg/m³)

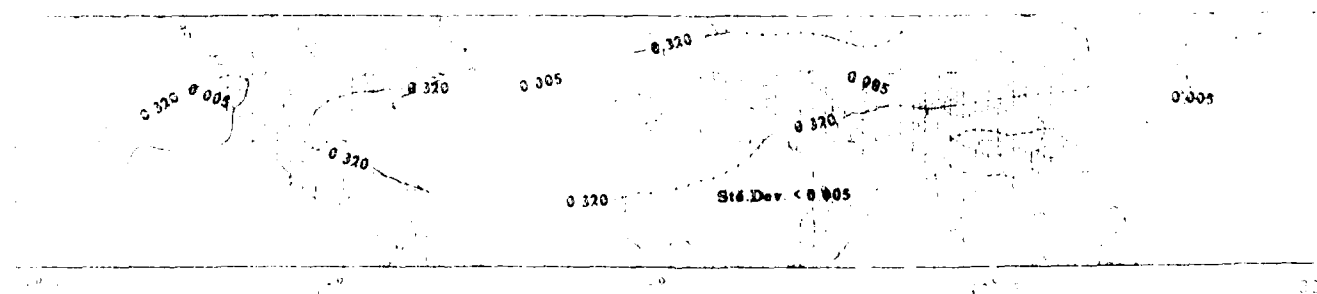
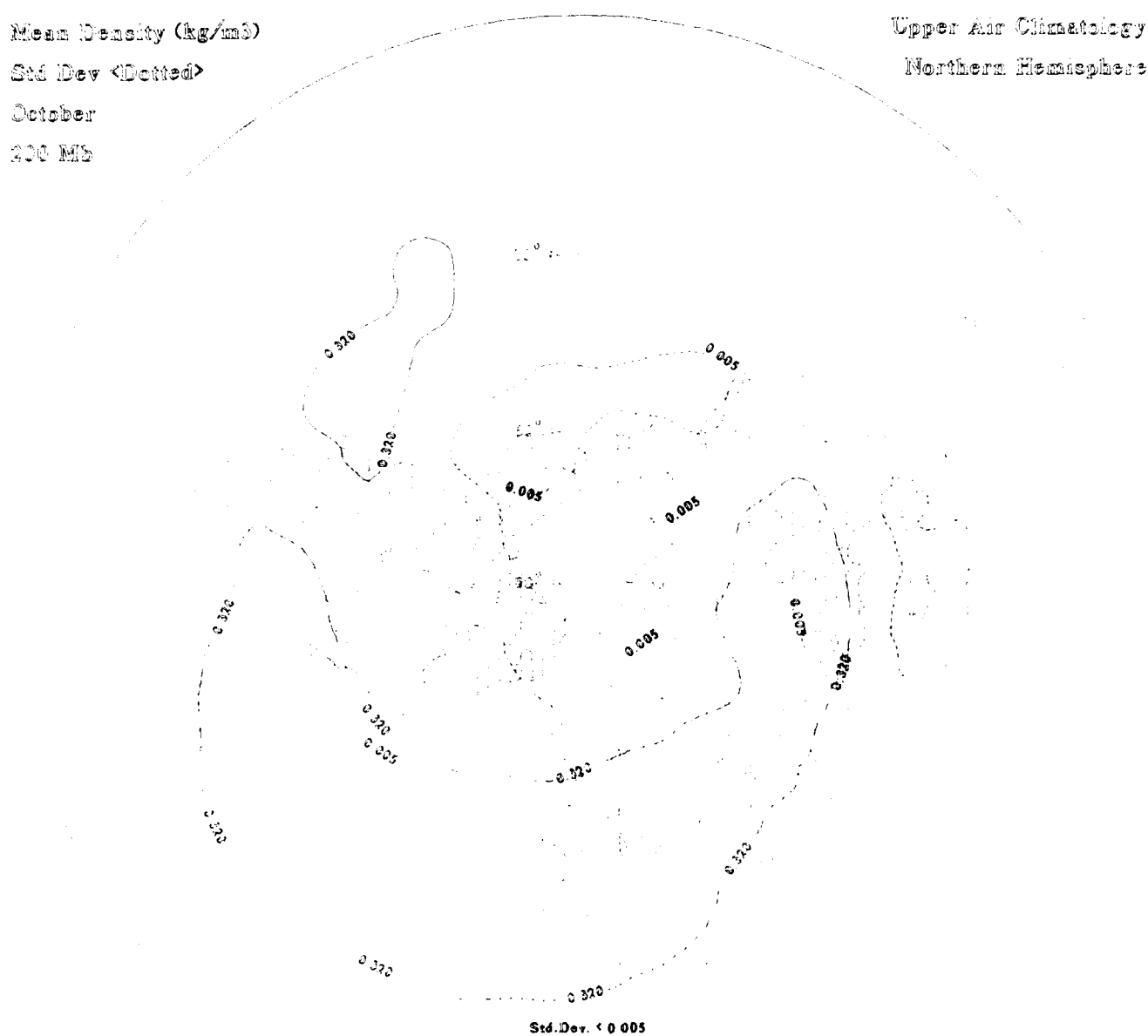
Std Dev (Dotted)

October

200 Mb

Upper Air Climatology

Northern Hemisphere



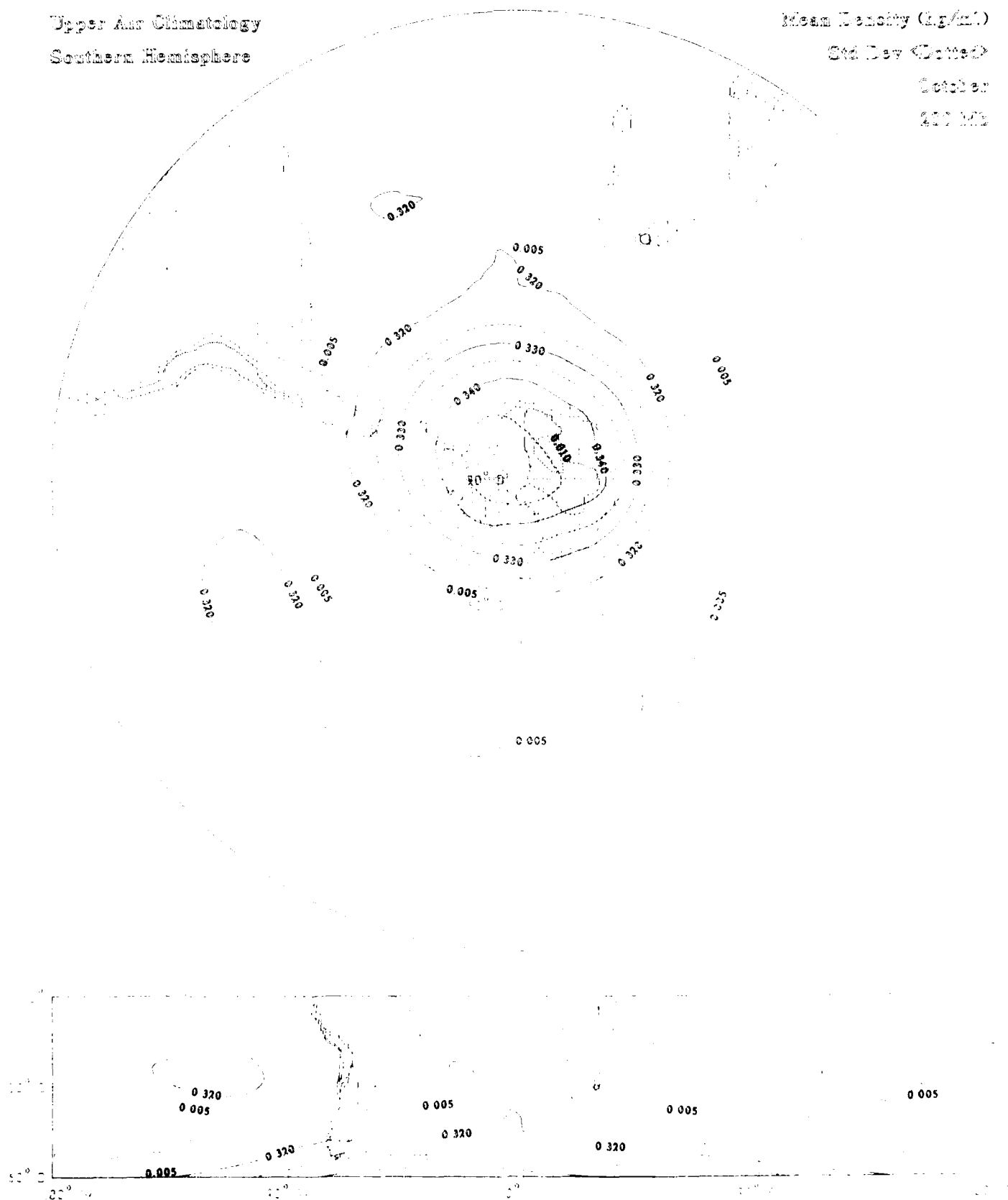
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m^3)

Std Dev (Dots)

October

417 372



Mean Density (kg/m³)

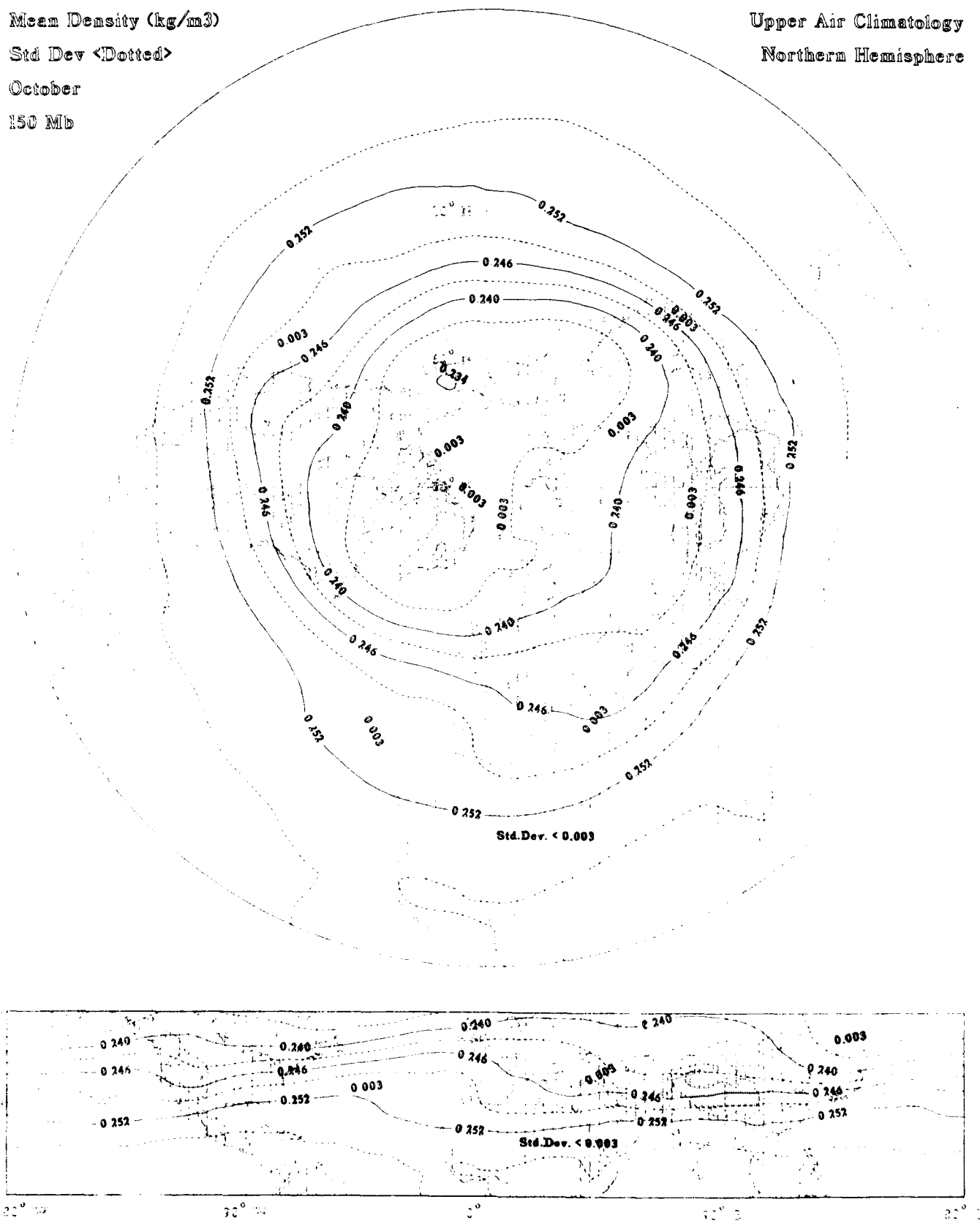
Std Dev <Dotted>

October

150 Mb

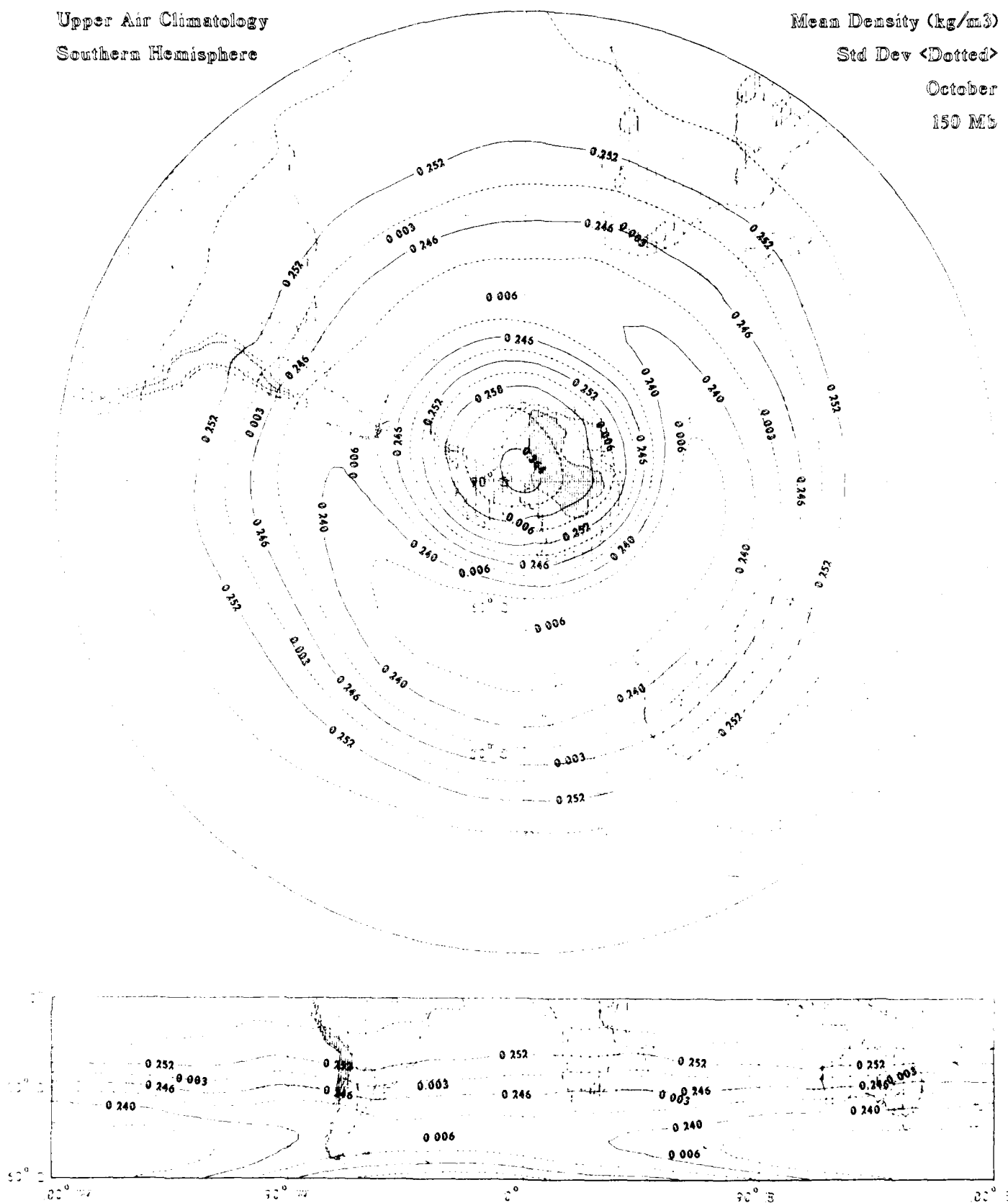
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)
Std Dev <Dotted>
October
150 MB



Mean Density (kg/m³)

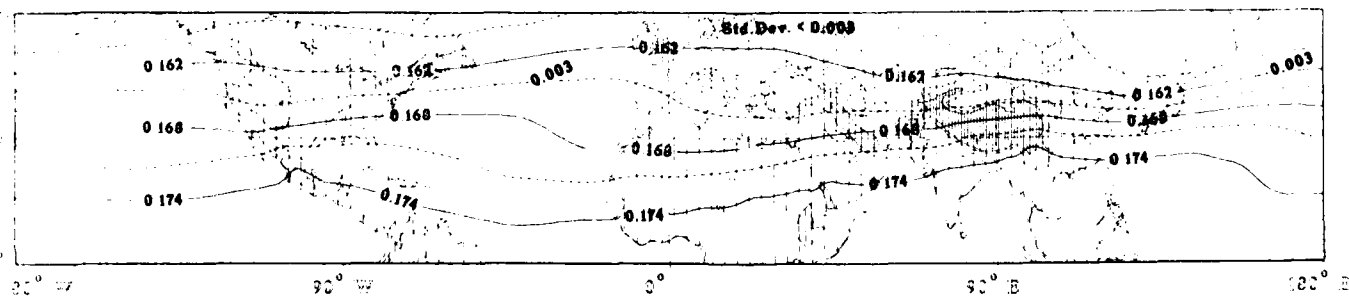
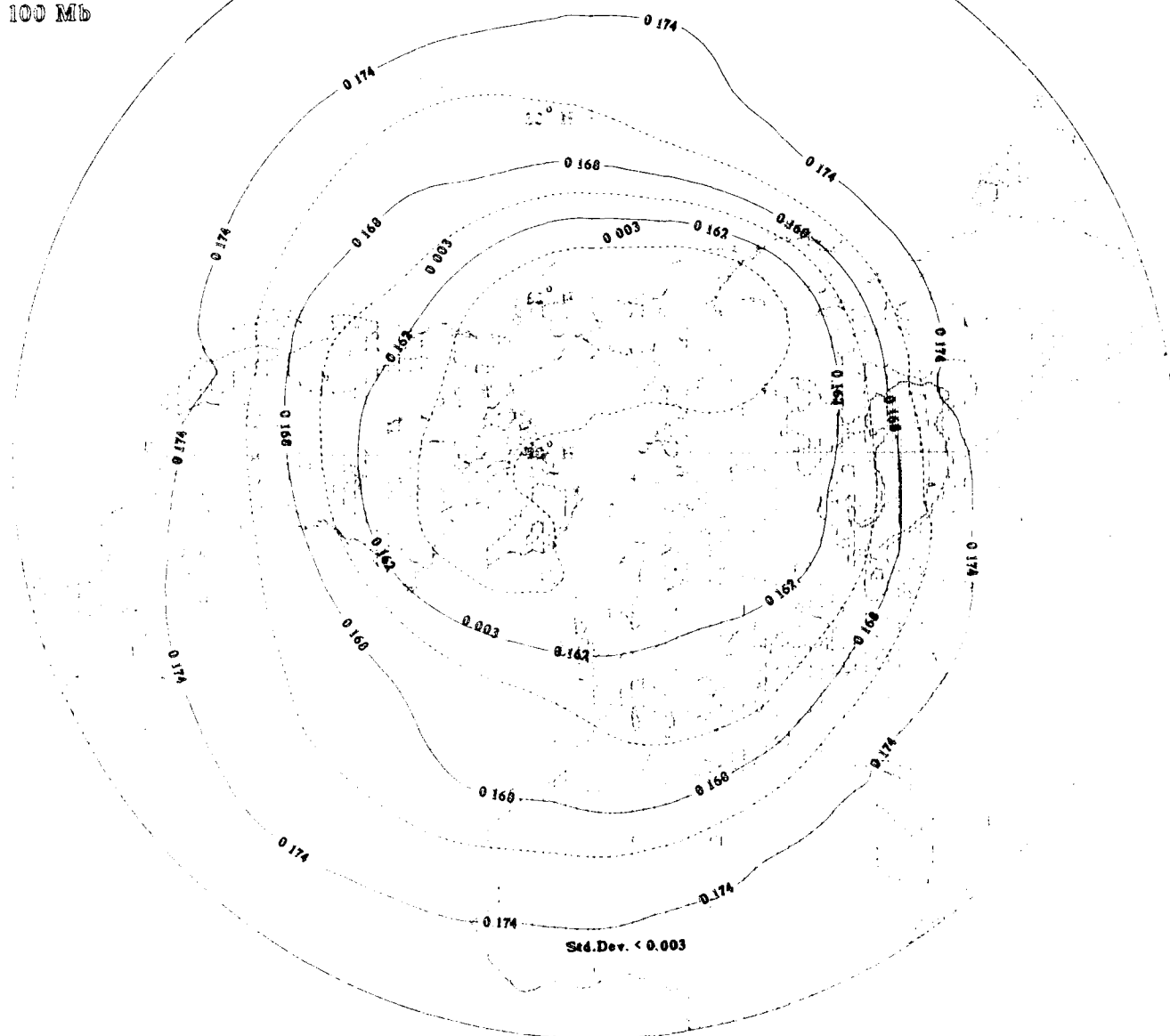
Std Dev <Dotted>

October

100 Mb

Upper Air Climatology

Northern Hemisphere



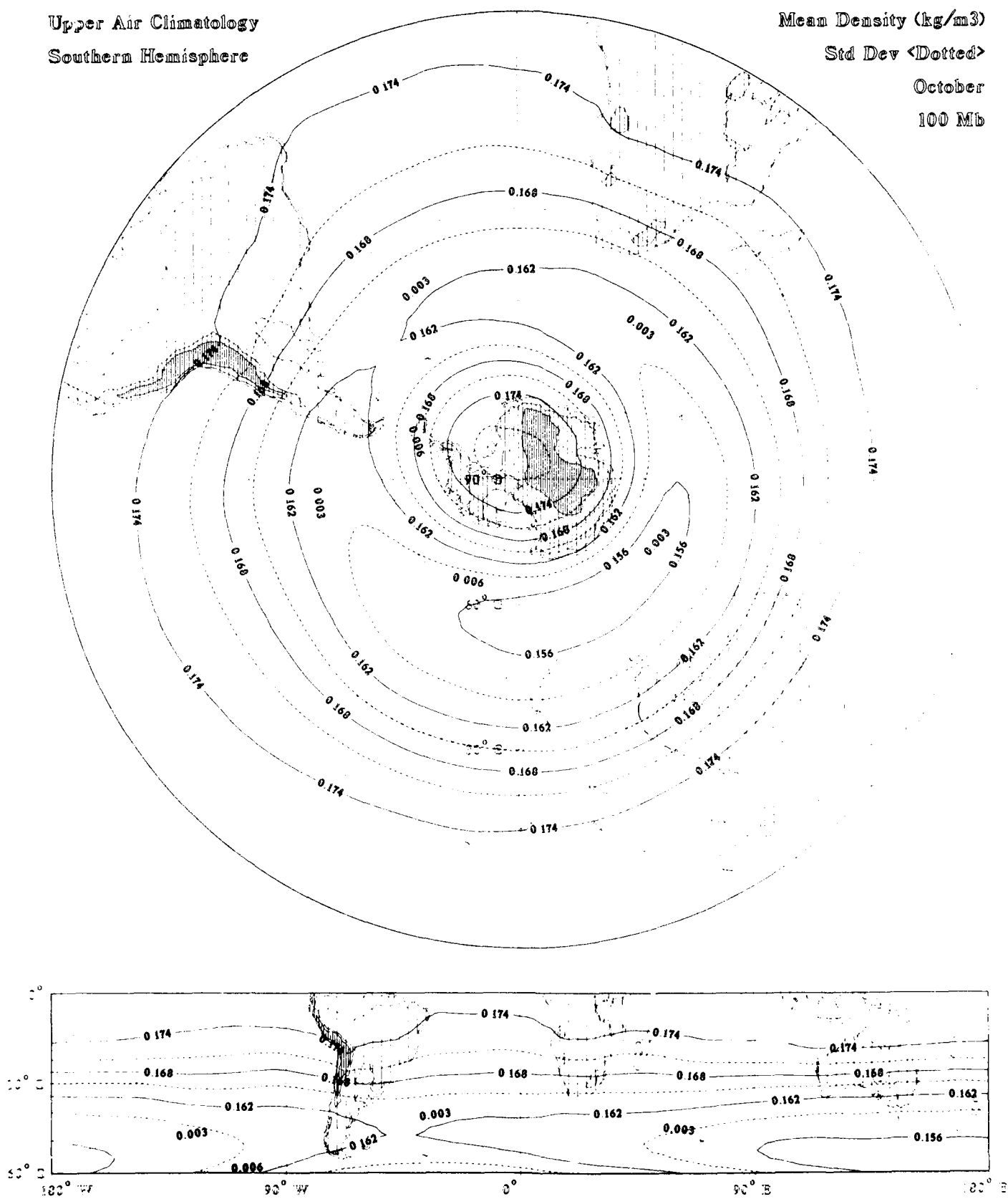
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

Std Dev <Dotted>

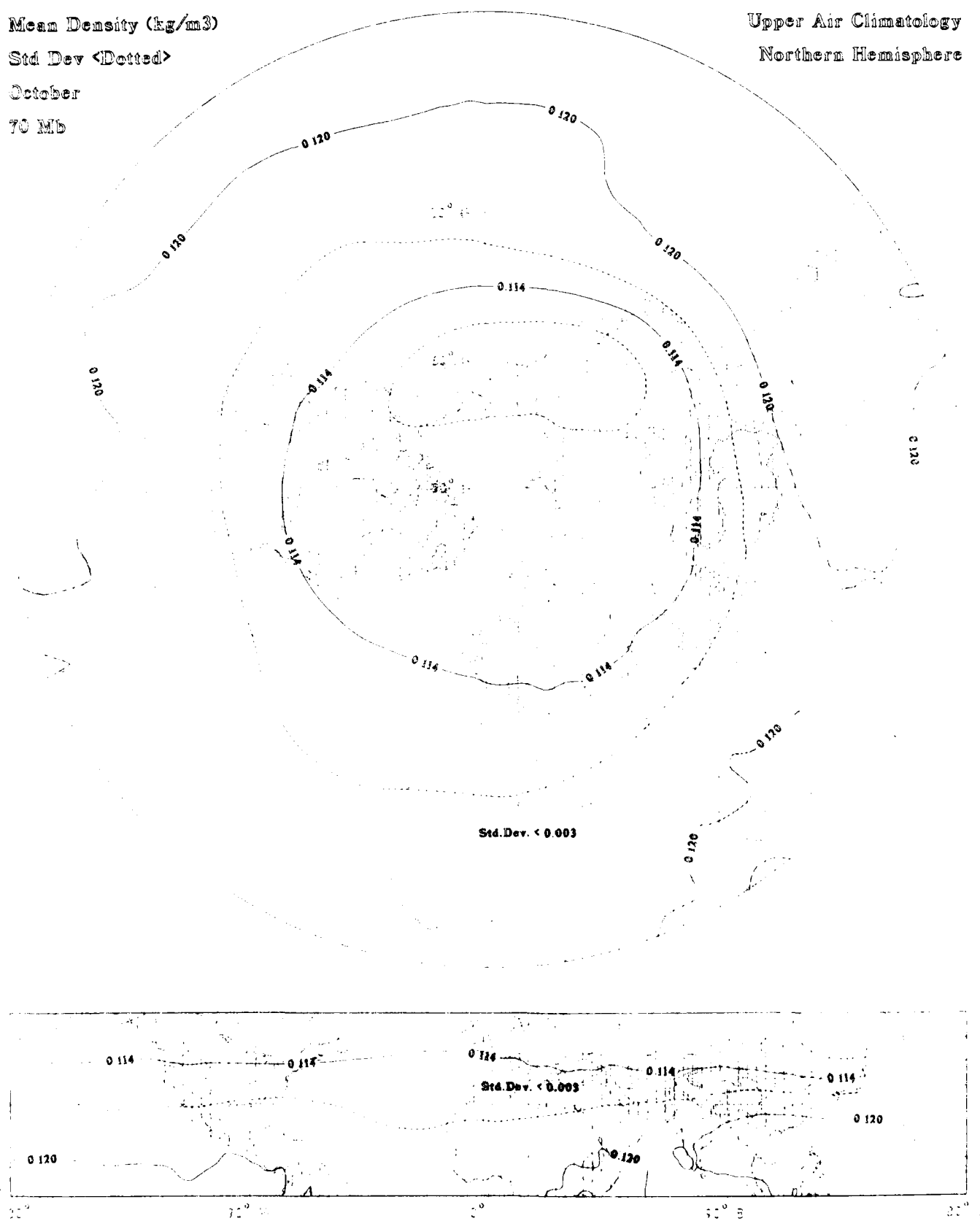
October

100 Mb

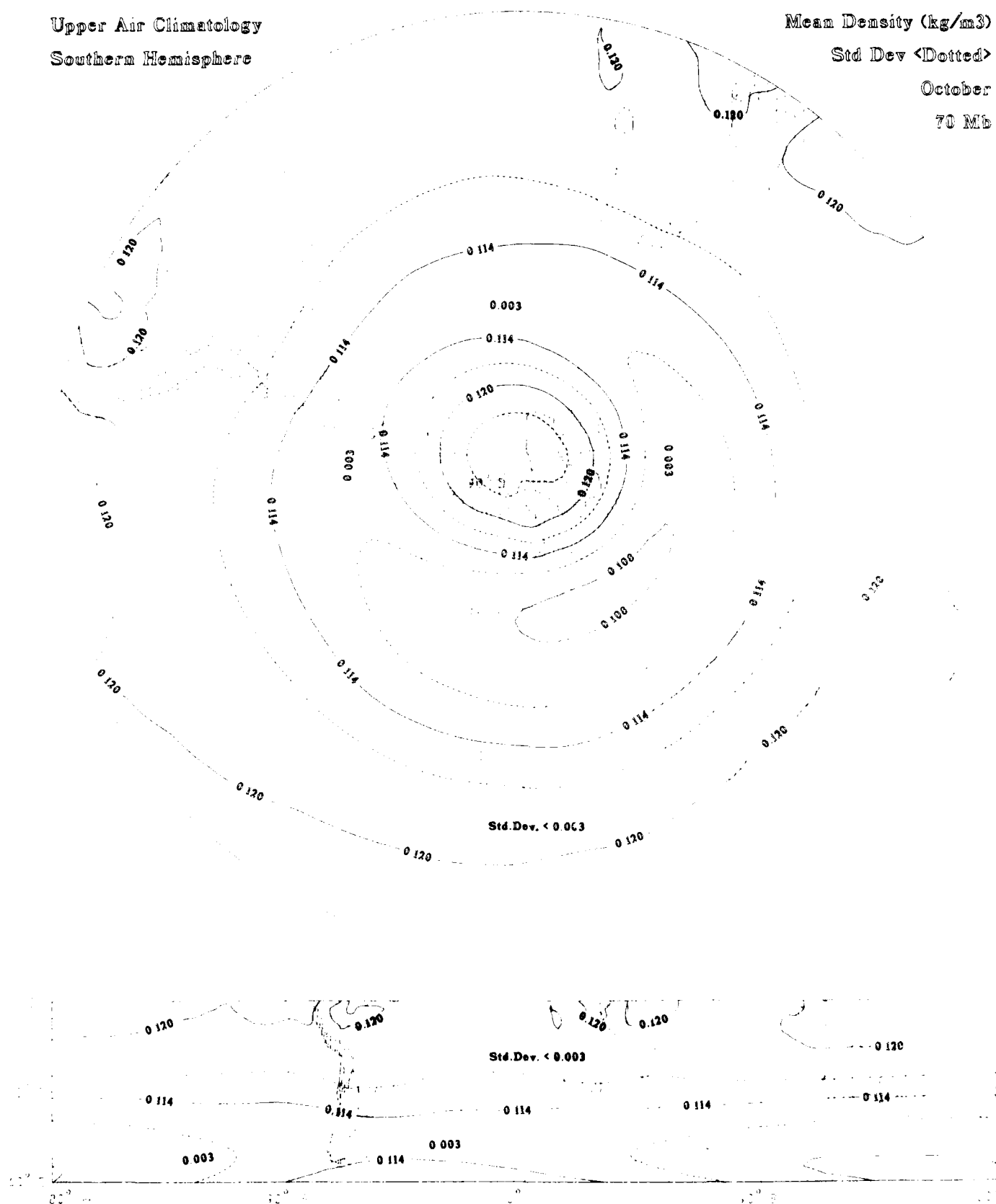


Mean Density (kg/m³)
 Std Dev <Dotted>
 October
 70 Mb

Upper Air Climatology
 Northern Hemisphere



Mean Density (kg/m3)
Std Dev <Dotted>
October
70 Mb



Mean Density (kg/m³)

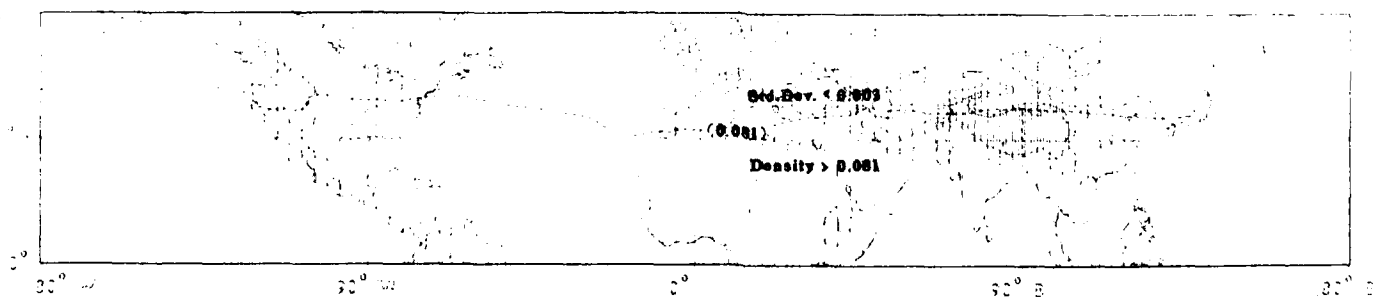
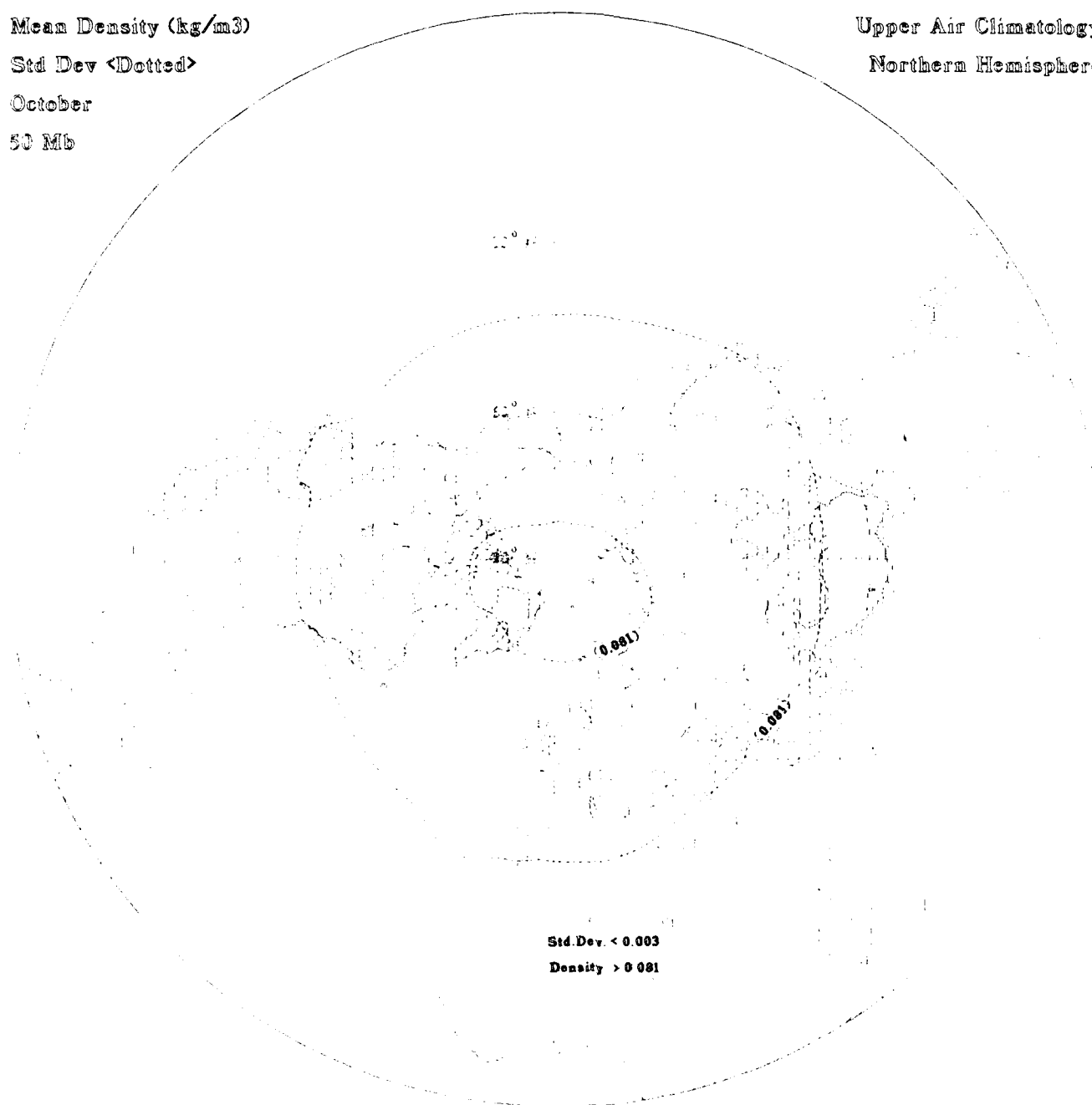
Std Dev <Dotted>

October

50 Mb

Upper Air Climatology

Northern Hemisphere



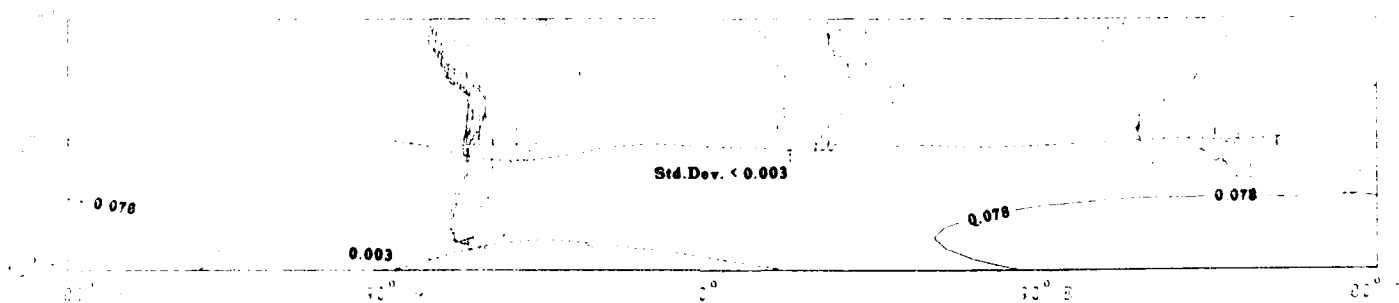
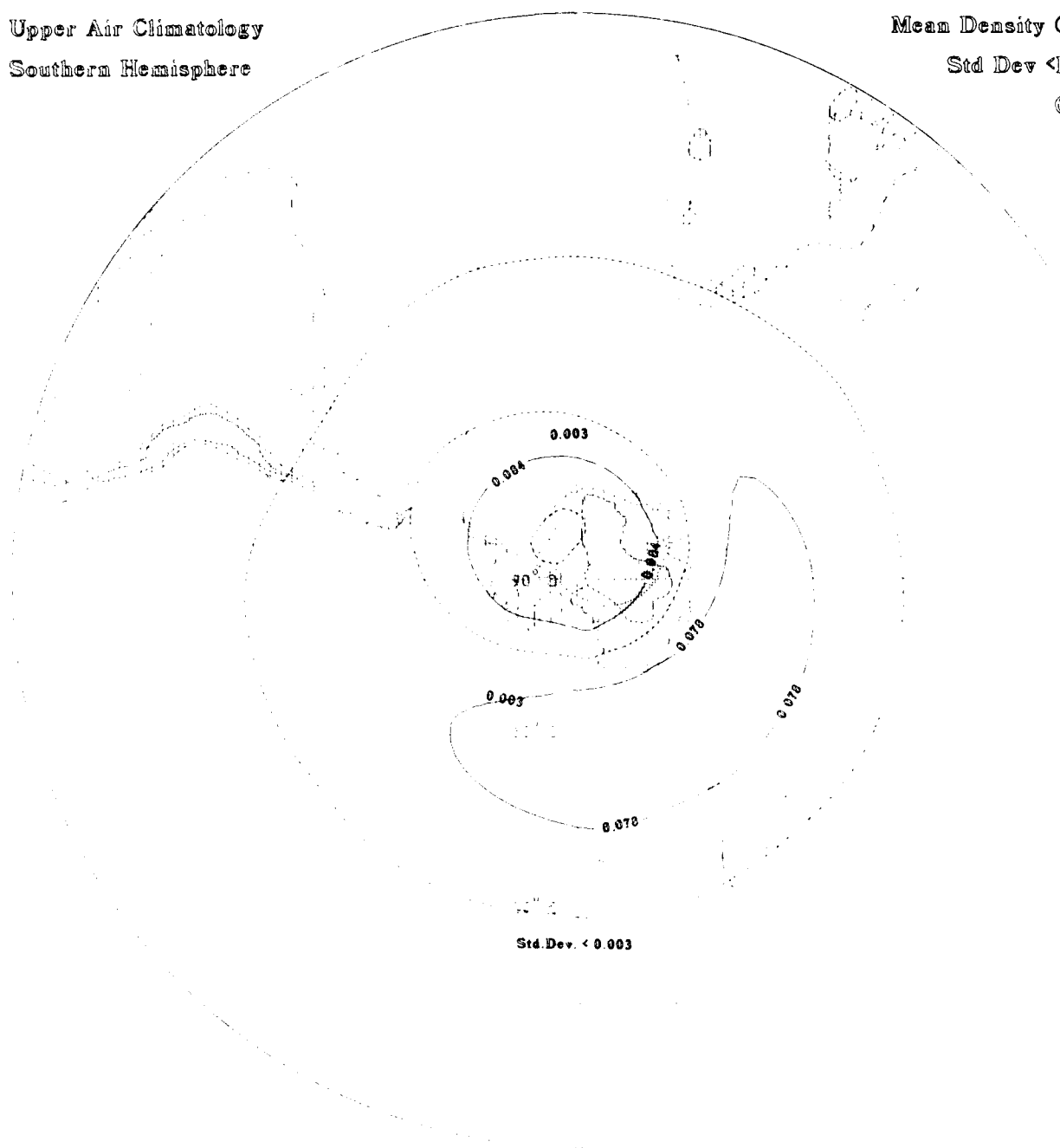
Upper Air Climatology
Southern Hemisphere

Mean Density (kg/m³)

Std Dev <Dotted>

October

50 Mb



Mean Density (kg/m³)

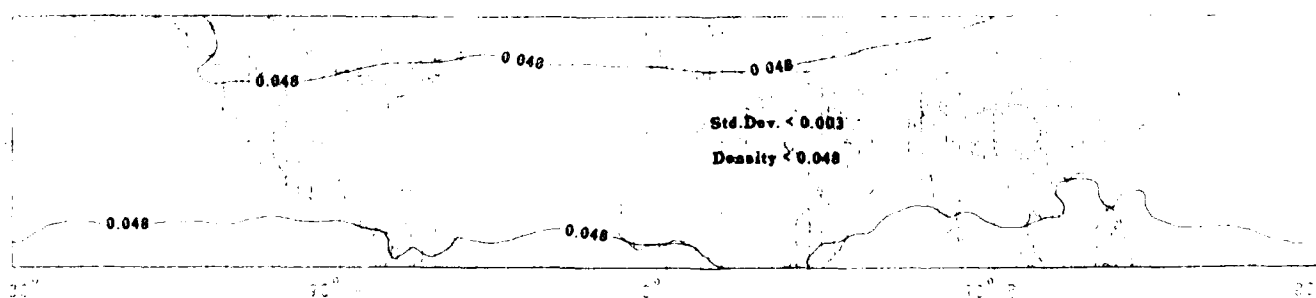
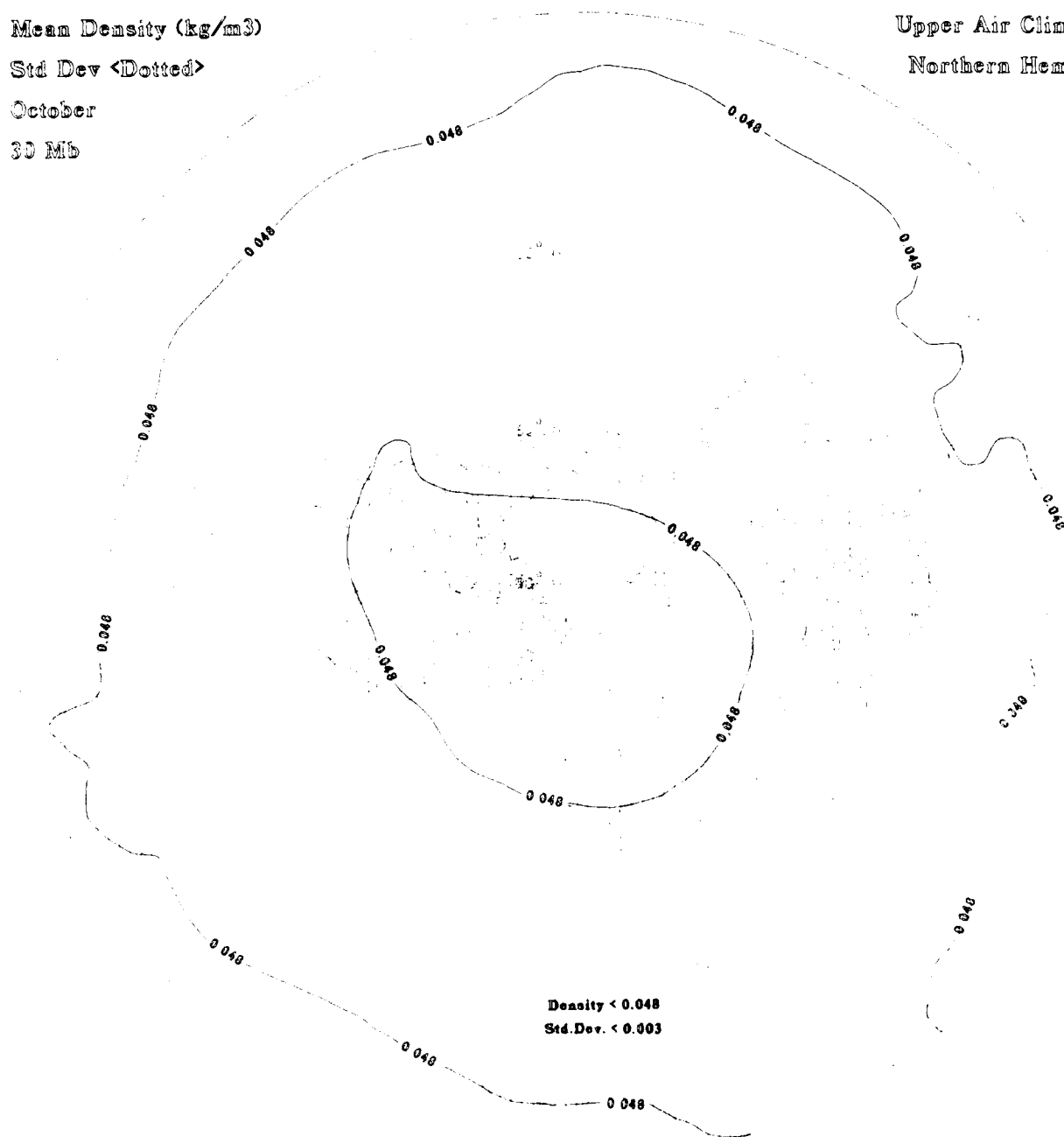
Std Dev <Dotted>

October

30 Mb

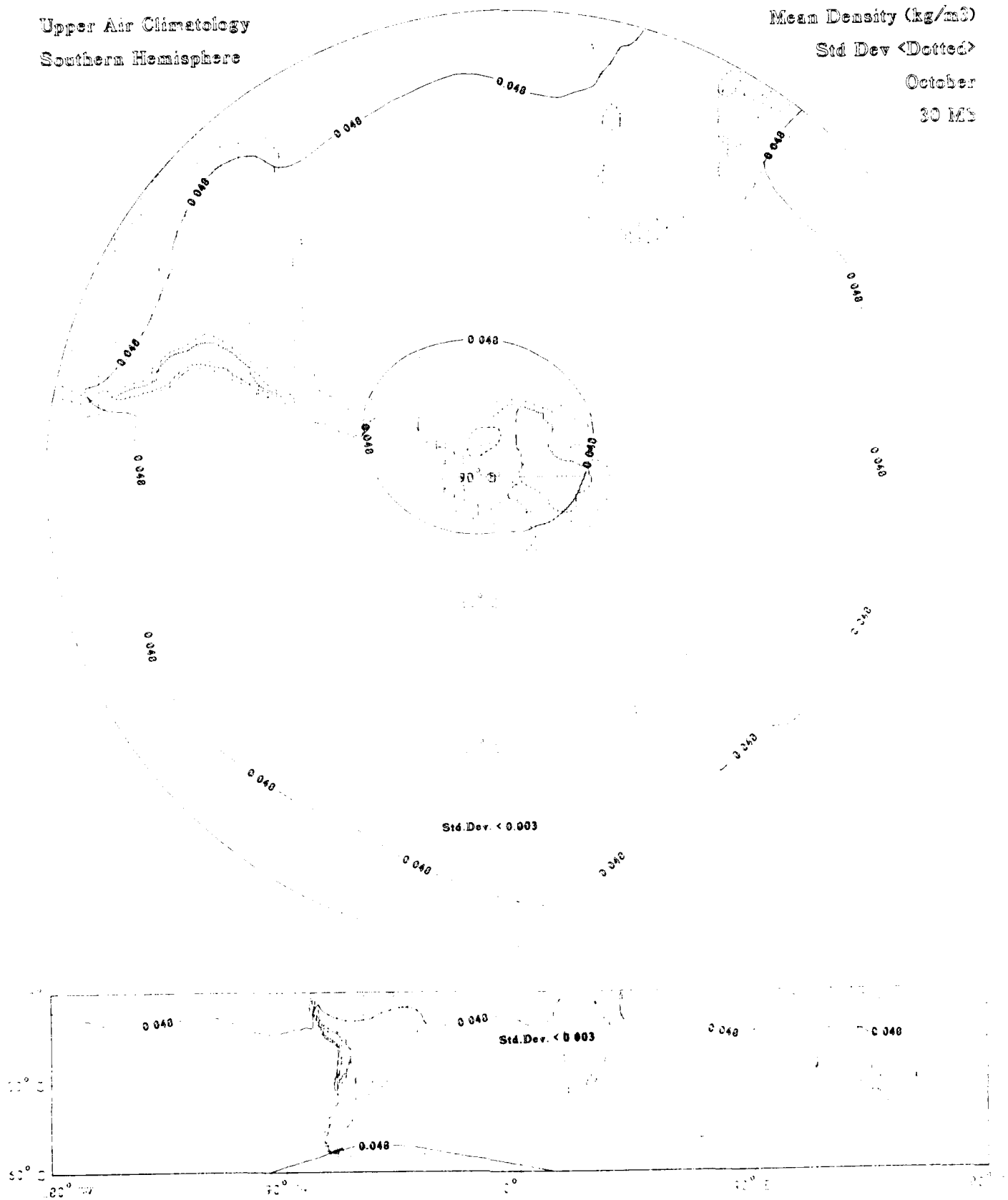
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

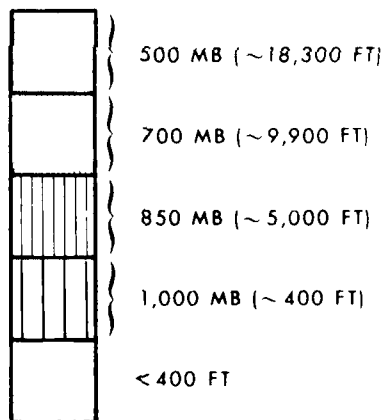
Mean Density (kg/m³)
Std Dev <Dotted>
October
30 MB



STANDARD DEVIATION OF HEIGHT
STANDARD DEVIATION OF VECTOR MEAN WIND
(13 LEVELS, 1000 TO 30 MB)

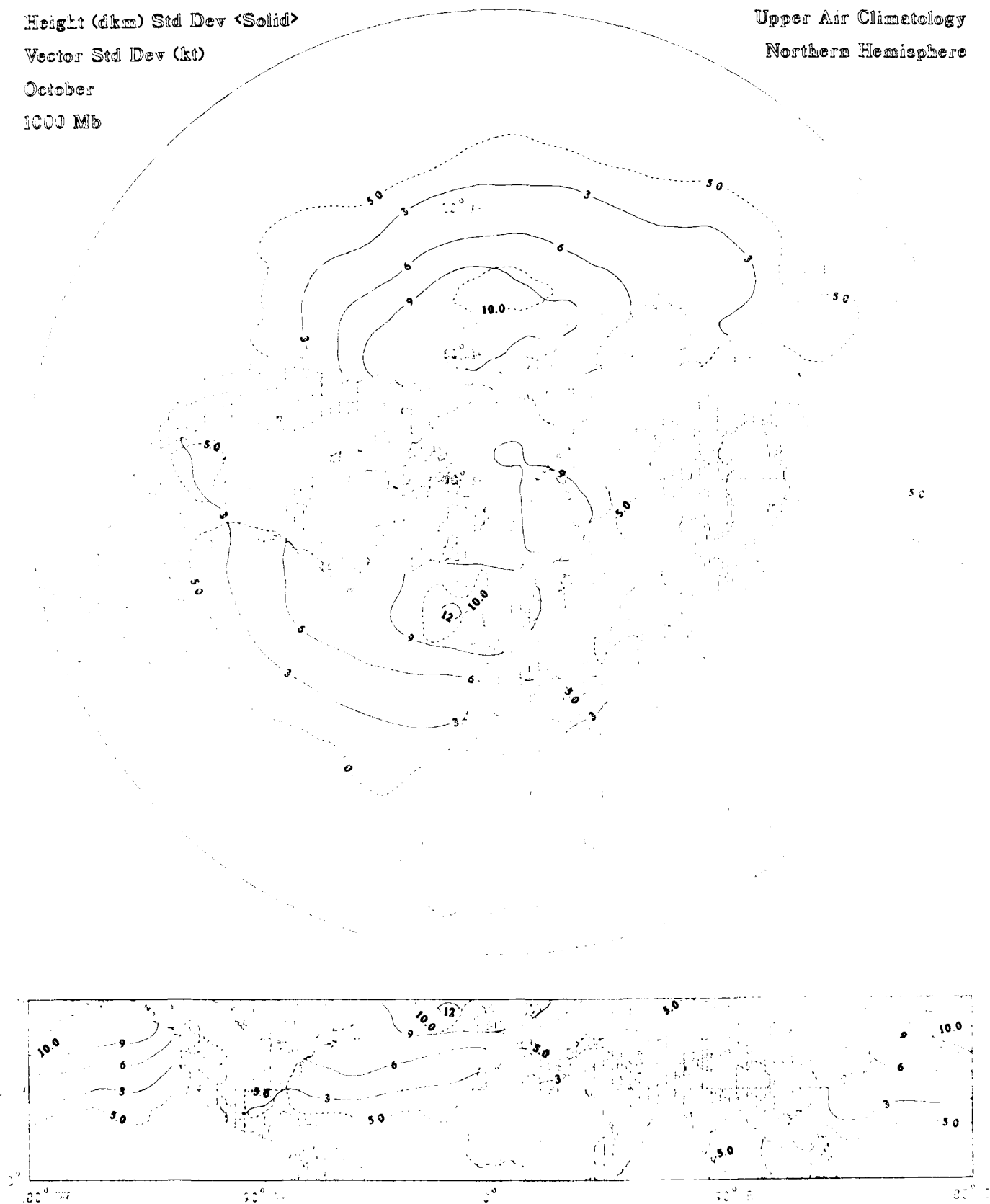
- Contours of standard deviation of height (solid lines) in geopotential dekameters
- Standard deviation of height labeled interval:
 - 3 dekameters (30 meters) - 1000 MB to 400 MB
 - 6 dekameters (60 meters) - 300 MB to 200 MB
 - 4 dekameters (40 meters) - 150 MB to 30 MB
- Contours of standard deviation of vector mean wind (dashed lines) in knots
- Standard deviation of vector mean wind labeled interval: 5 knots
- Contours blanked for geographic areas with elevations exceeding specified geopotential heights

ELEVATION SCALE



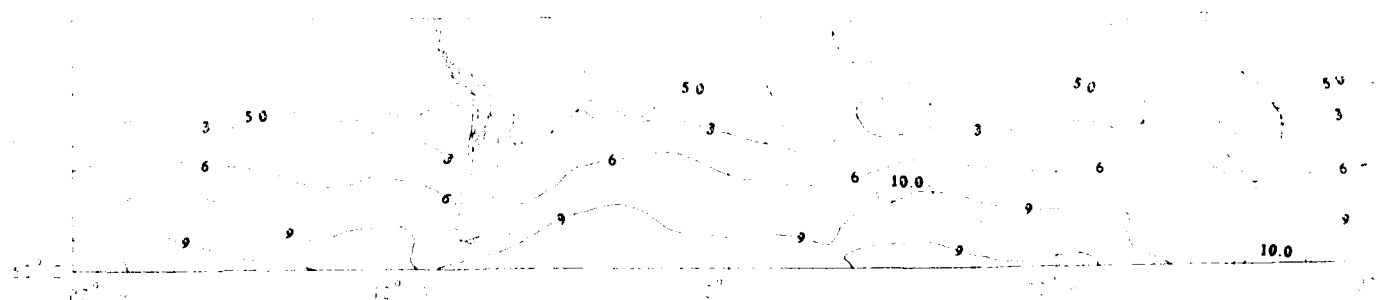
1000 Mb

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
1001 mb



Height (kkm) Std Dev <Solid>

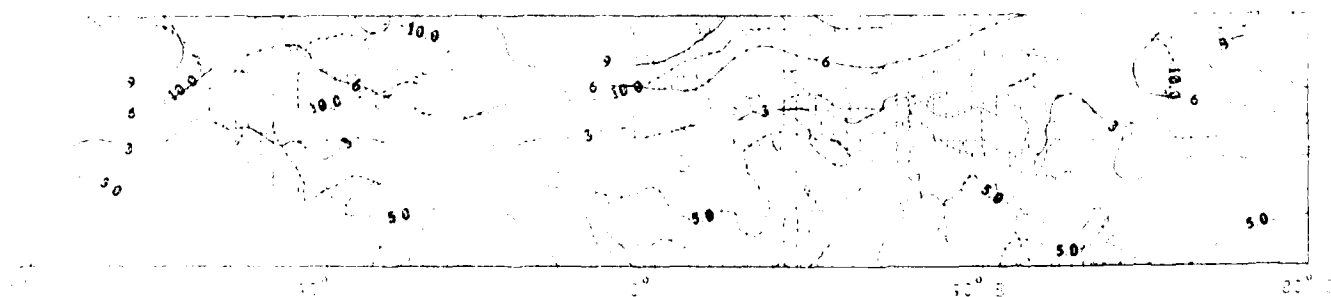
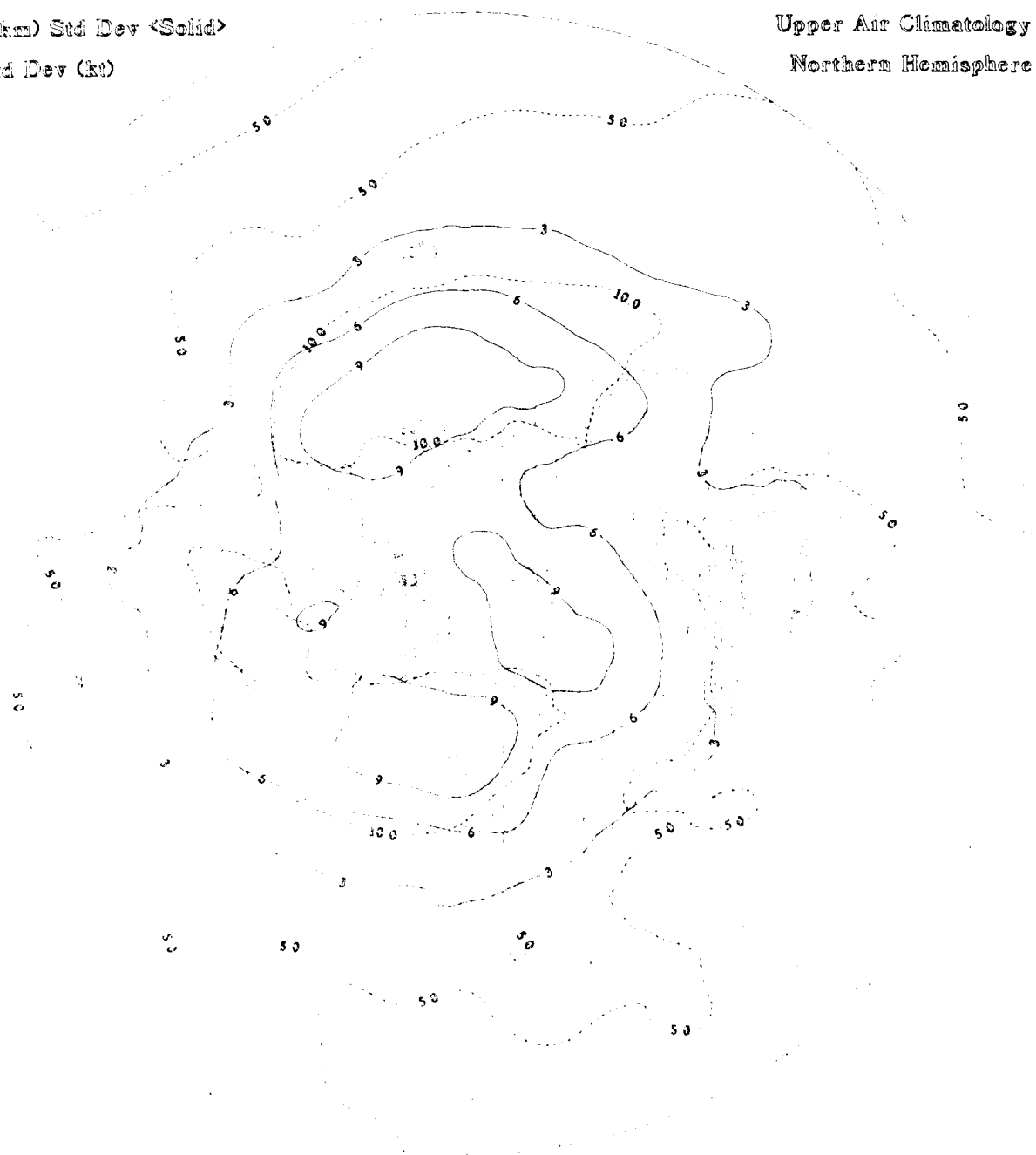
Vector Std Dev (kt)

October

350 MB

Upper Air Climatology

Northern Hemisphere



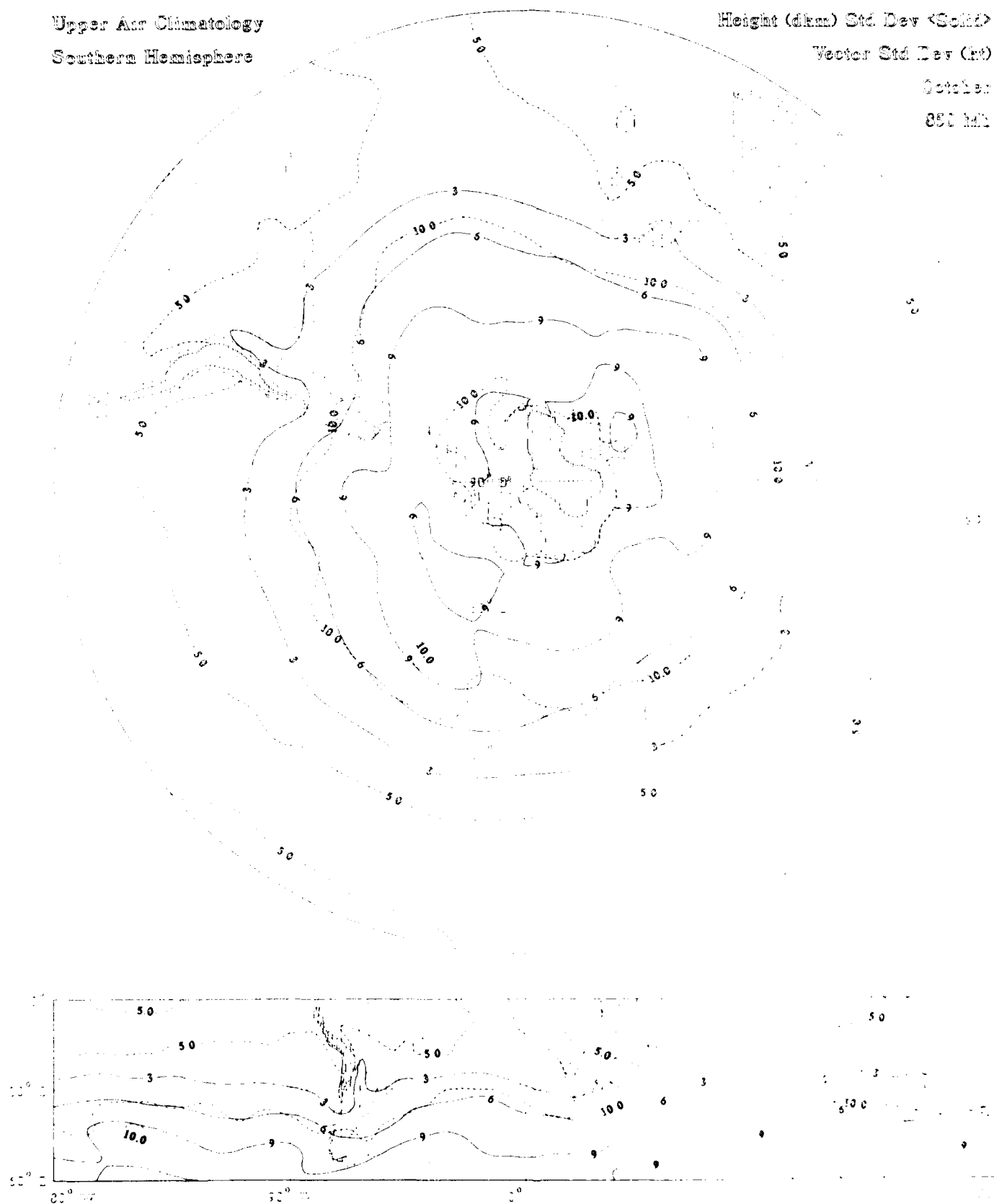
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std. Dev. <Solid>

Vector Std. Dev. (dashed)

October

850 mb



Height (dkm) Std Dev <Solid>

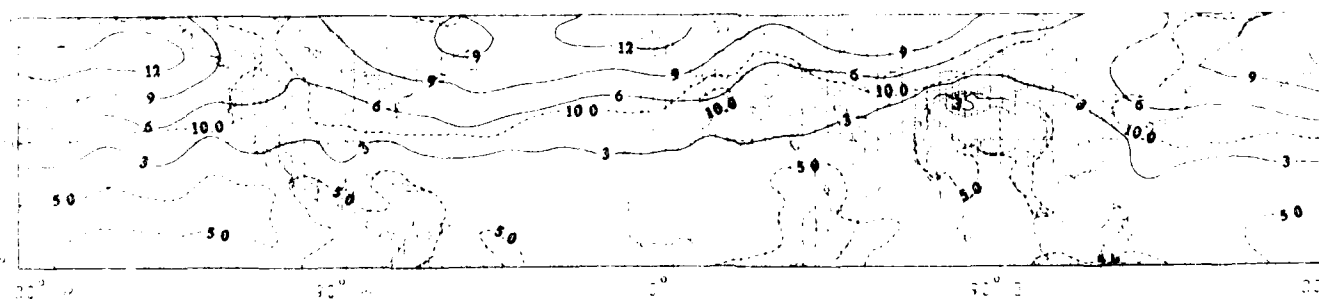
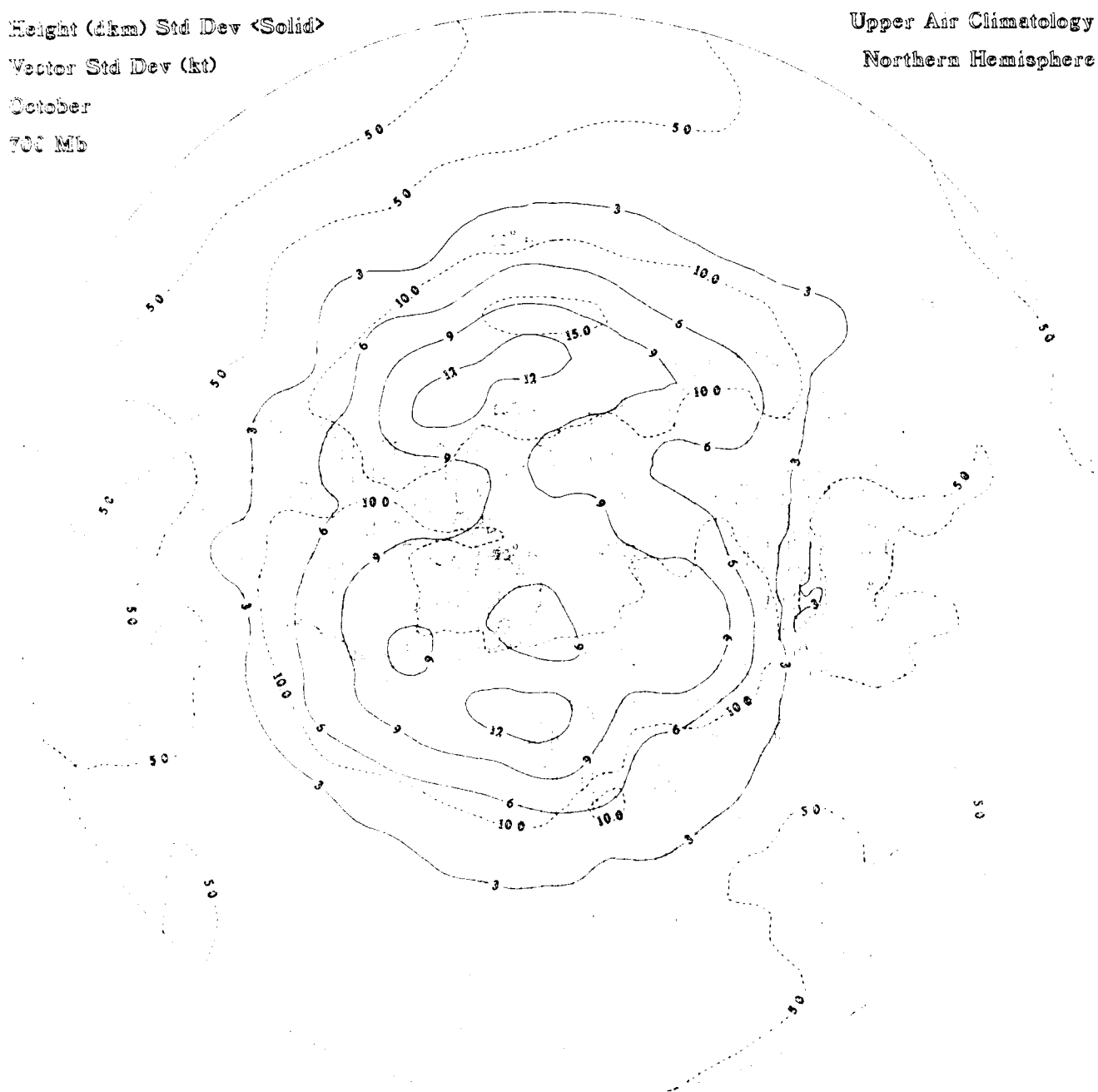
Vector Std Dev (kt)

October

700 Mb

Upper Air Climatology

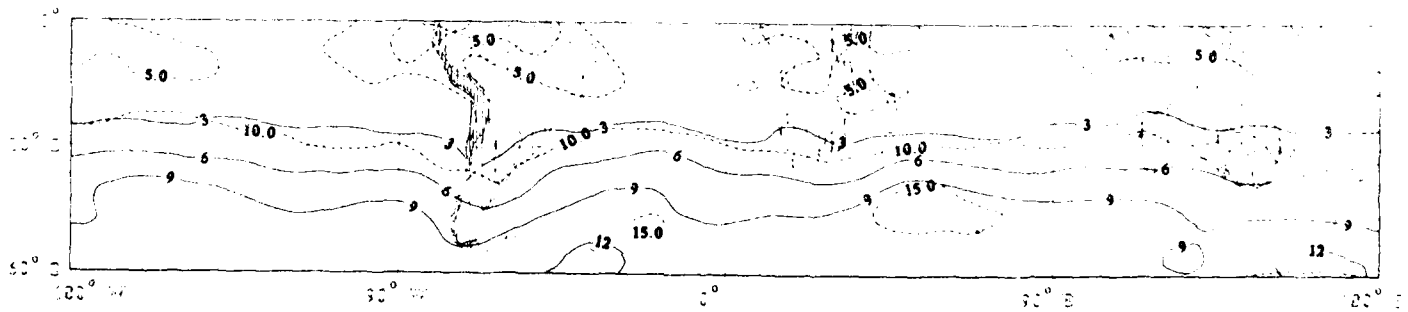
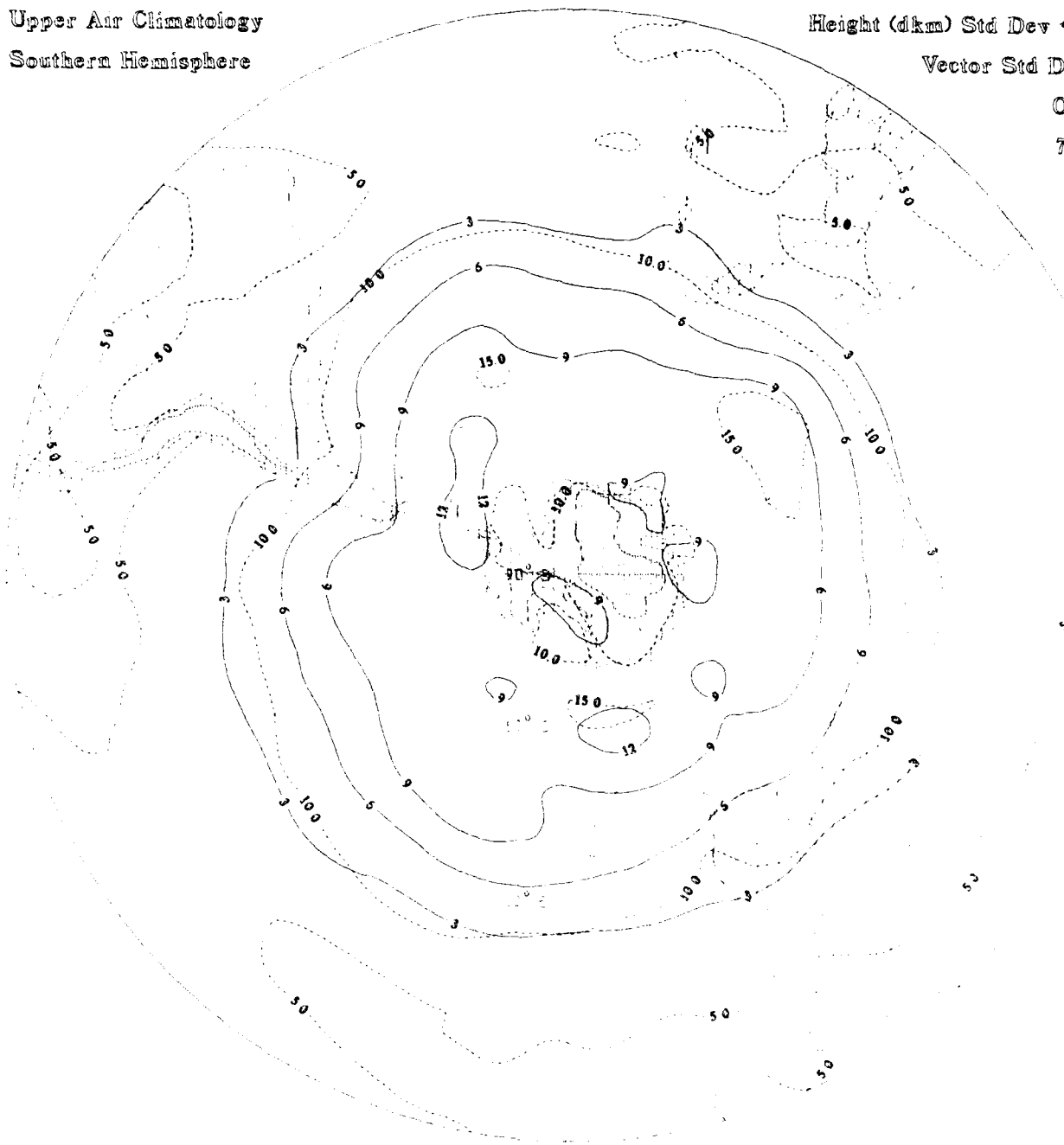
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)

October
700 Mb



Height (dkm) Std Dev (Solid)

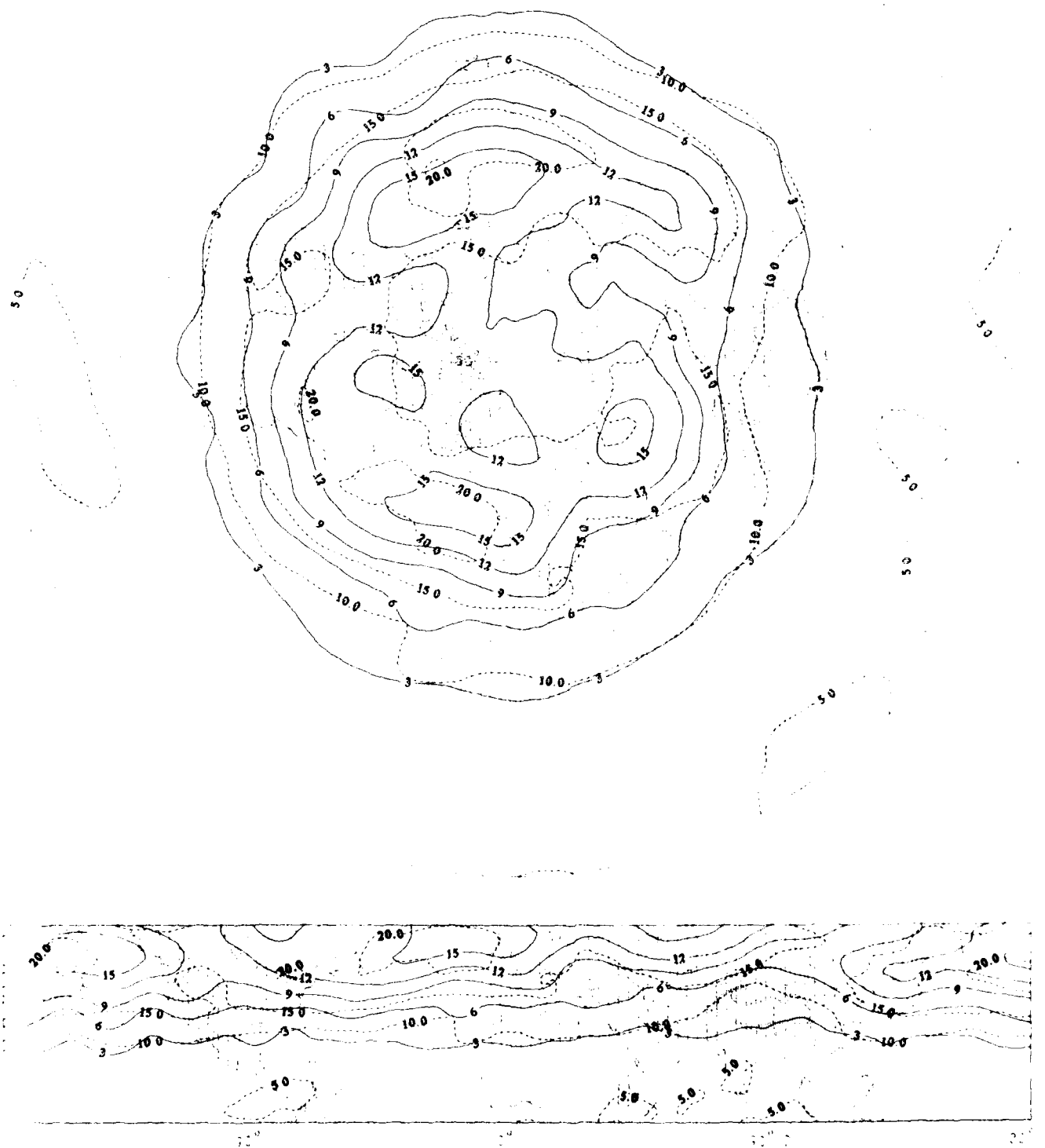
Vector Std Dev (kt)

October

500 Mb

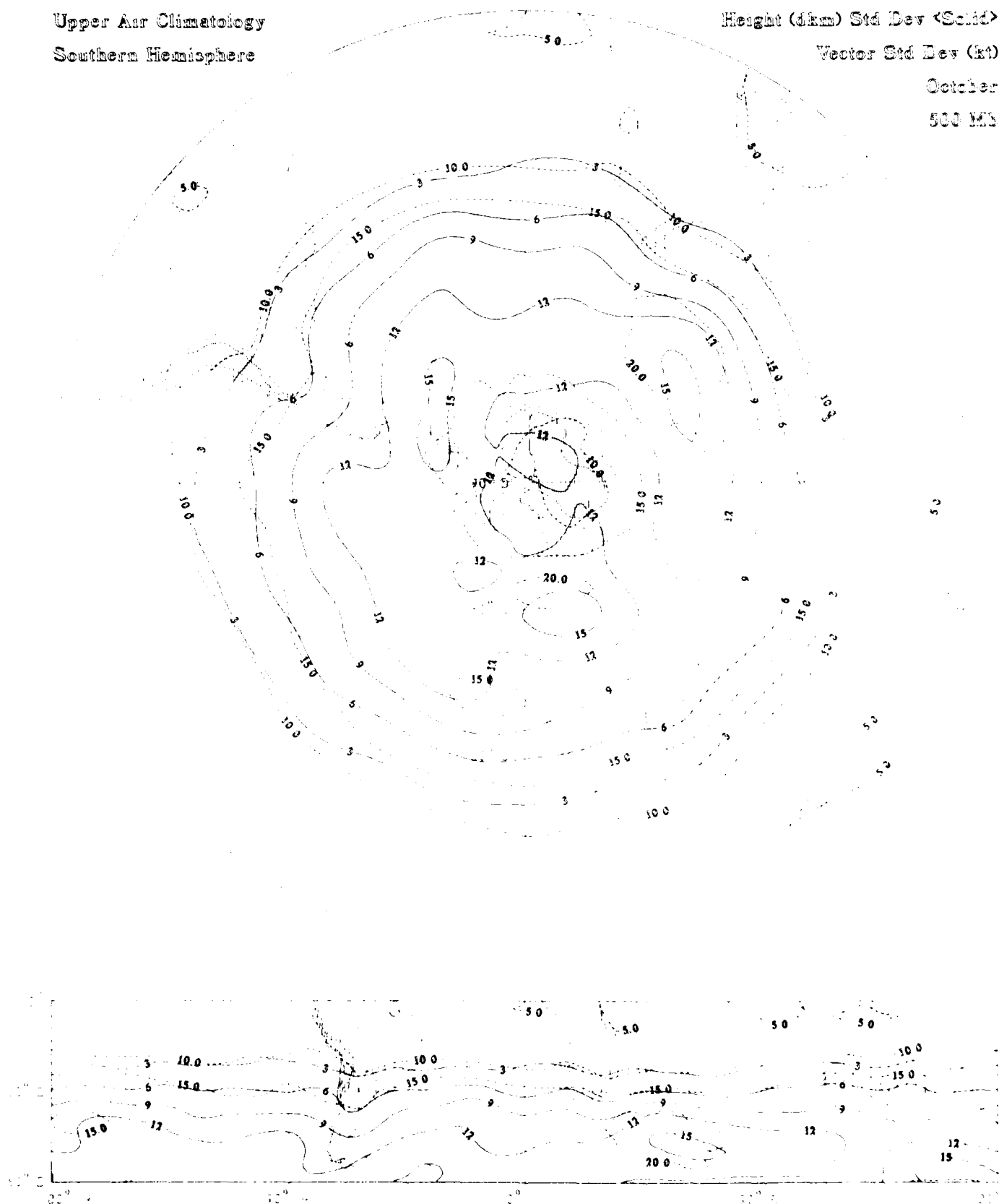
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev (Solid)
Vector Std Dev (kt)
October
500 MB



Height (dkm) Std Dev (Solid)

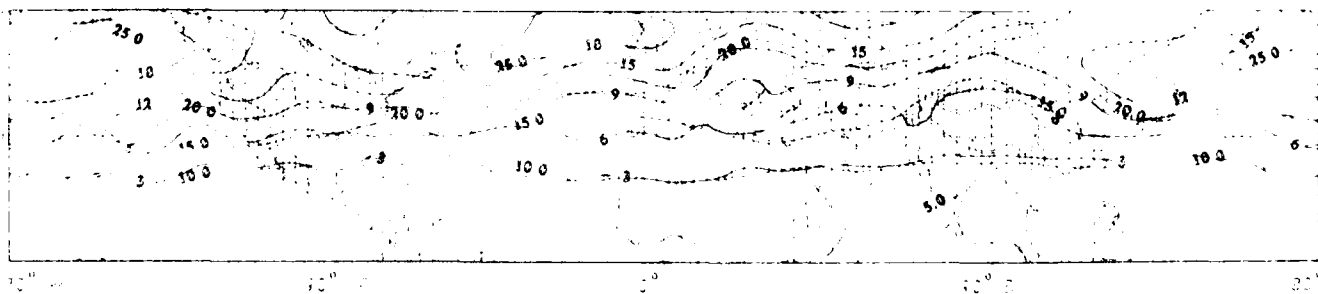
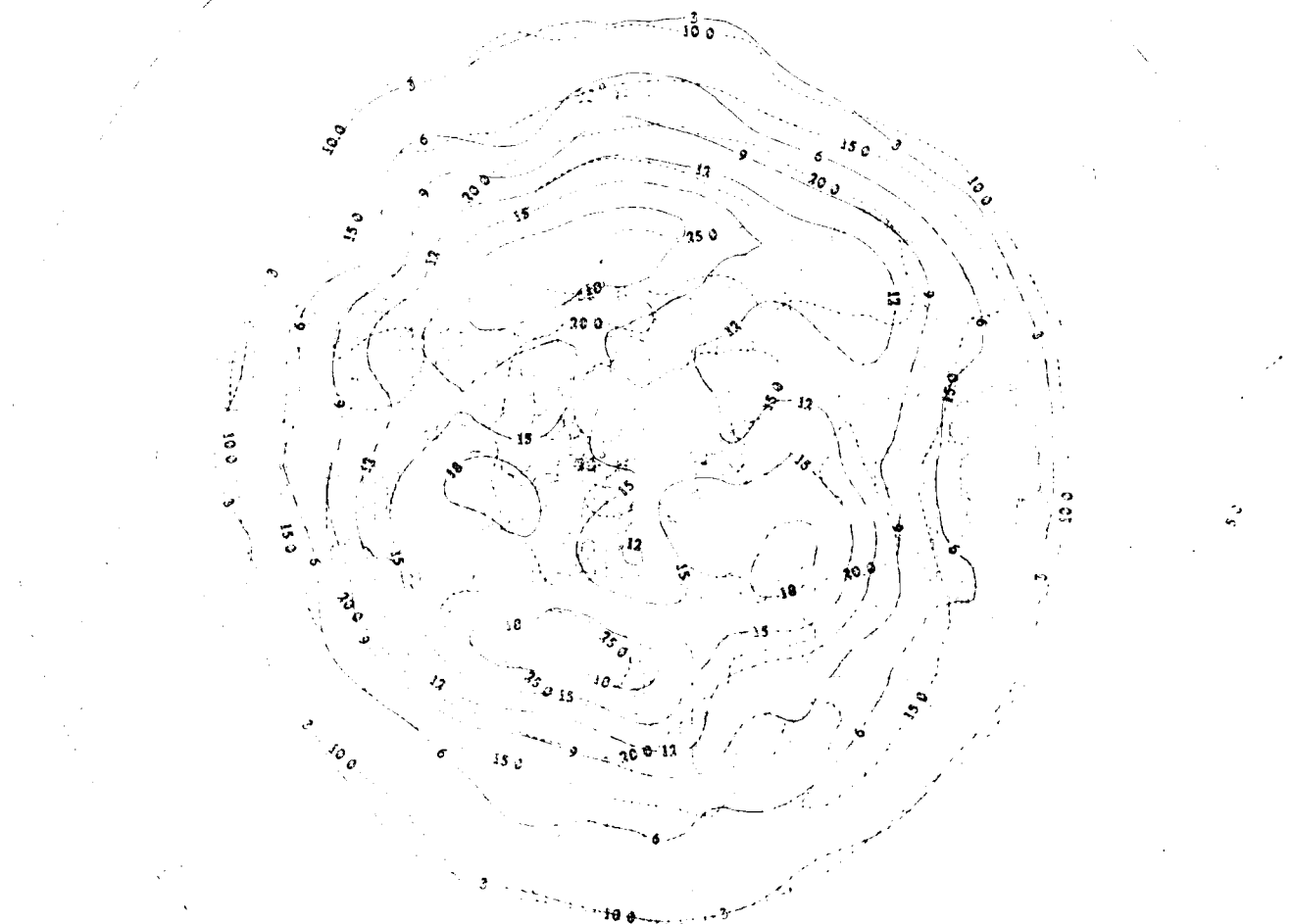
Vector Std Dev (kt)

October

400 MB

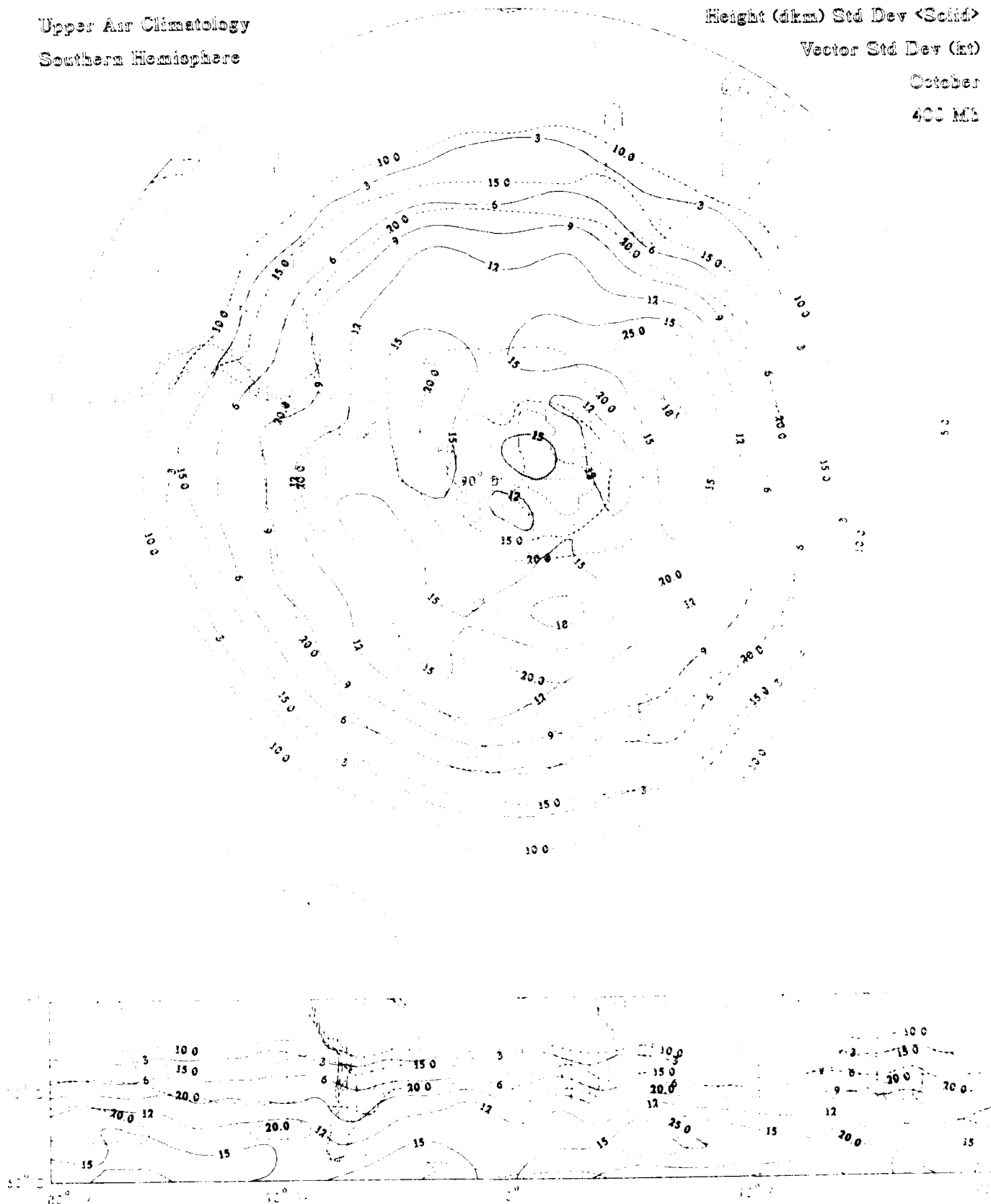
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
400 MB



Height (dkm) Std Dev <Solid>

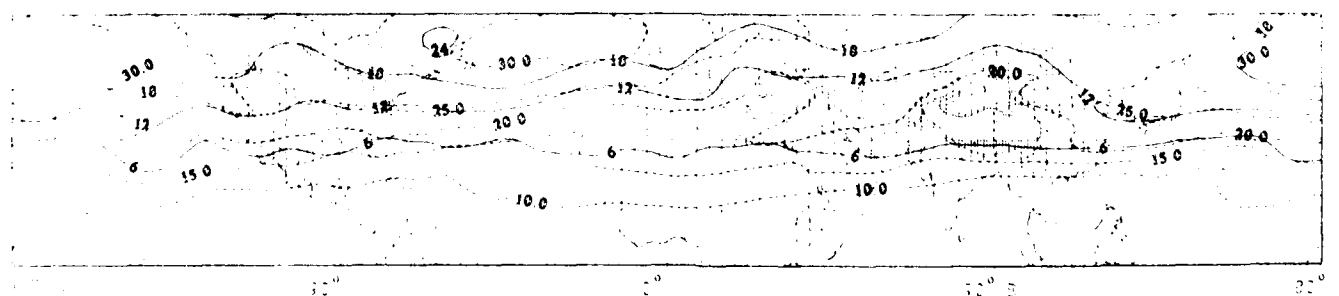
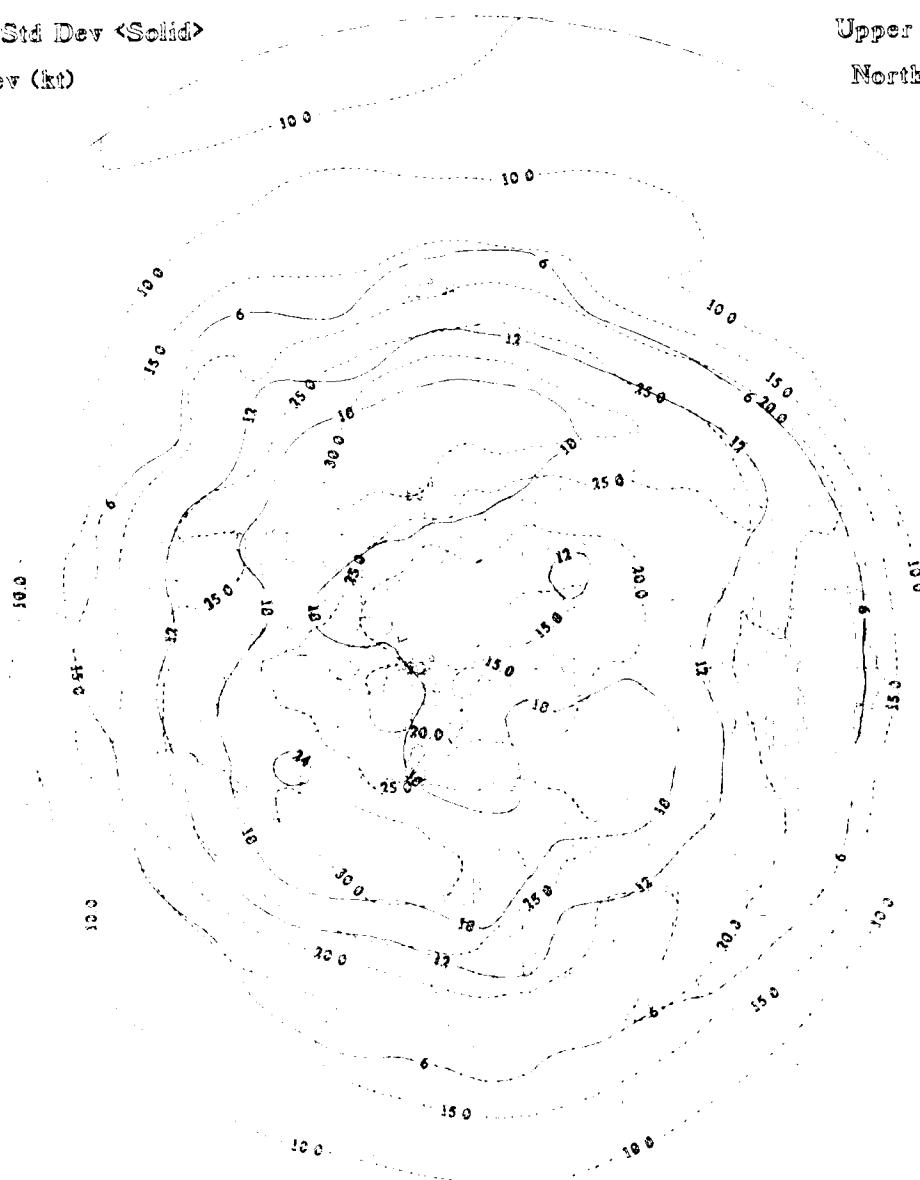
Vector Std Dev (kt)

October

300 MB

Upper Air Climatology

Northern Hemisphere



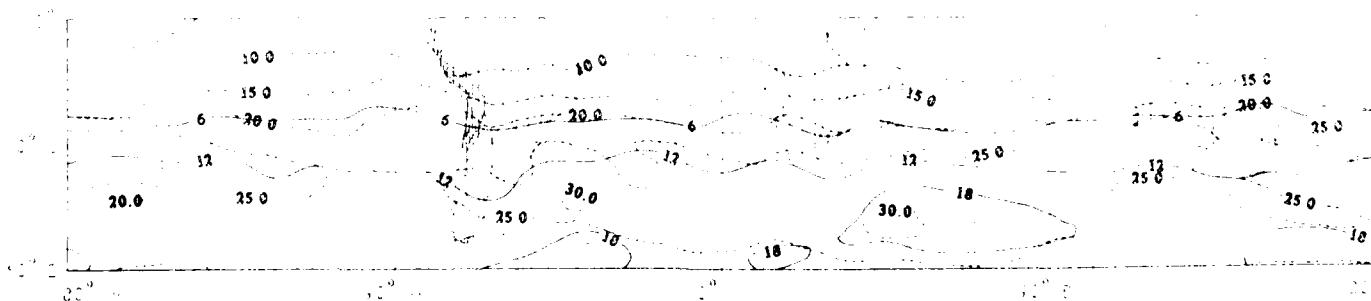
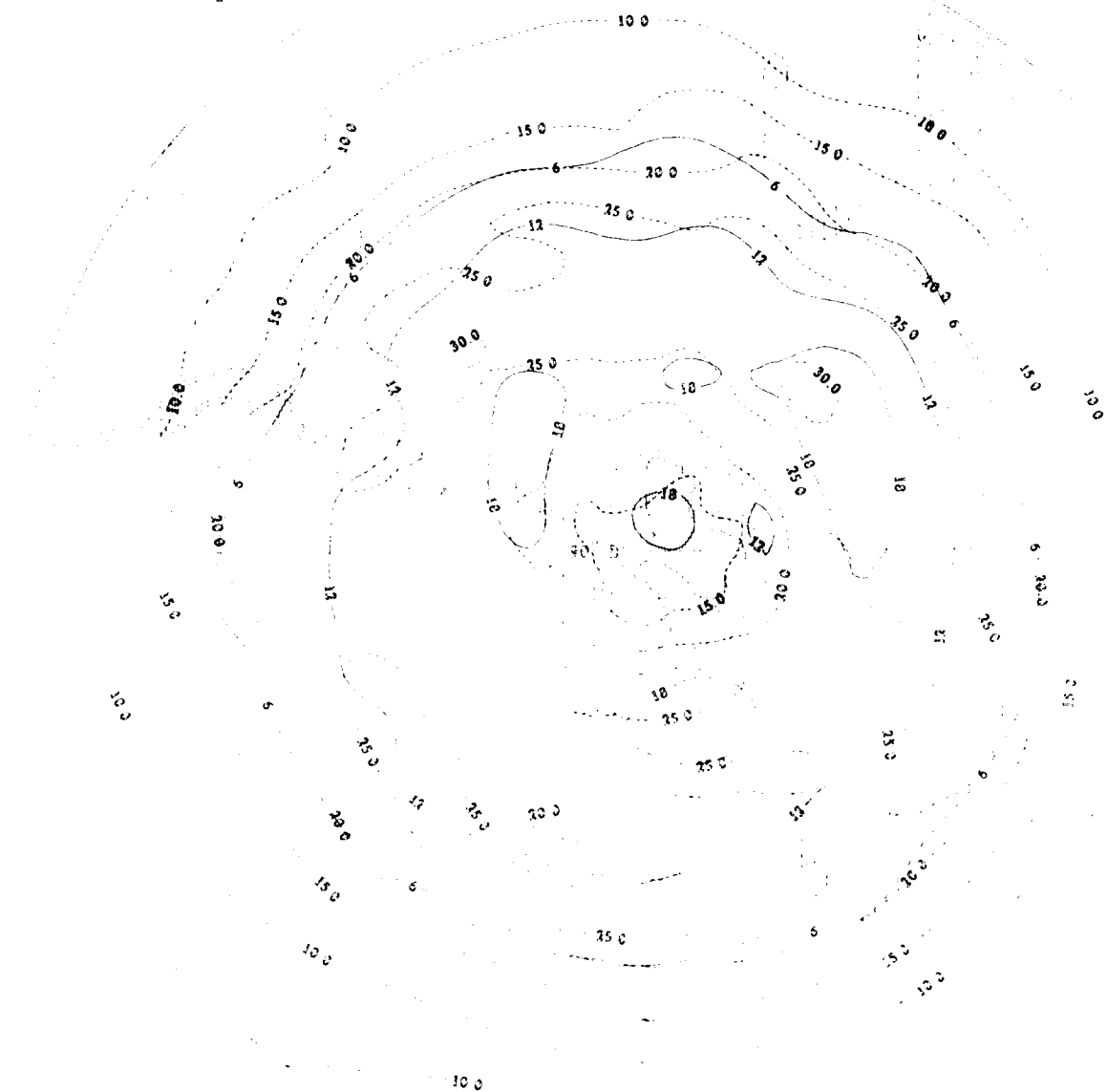
Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>

Vector Std Dev (kt)

October:

300 MB



Height (gkm) Std Dev (Solid)

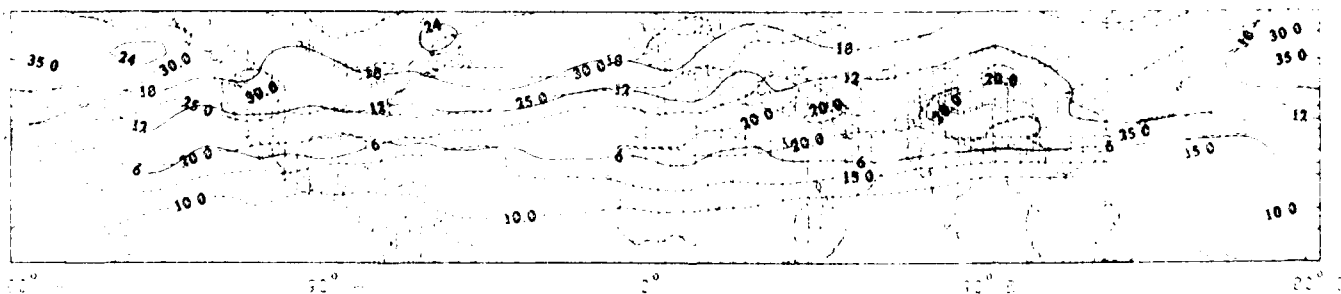
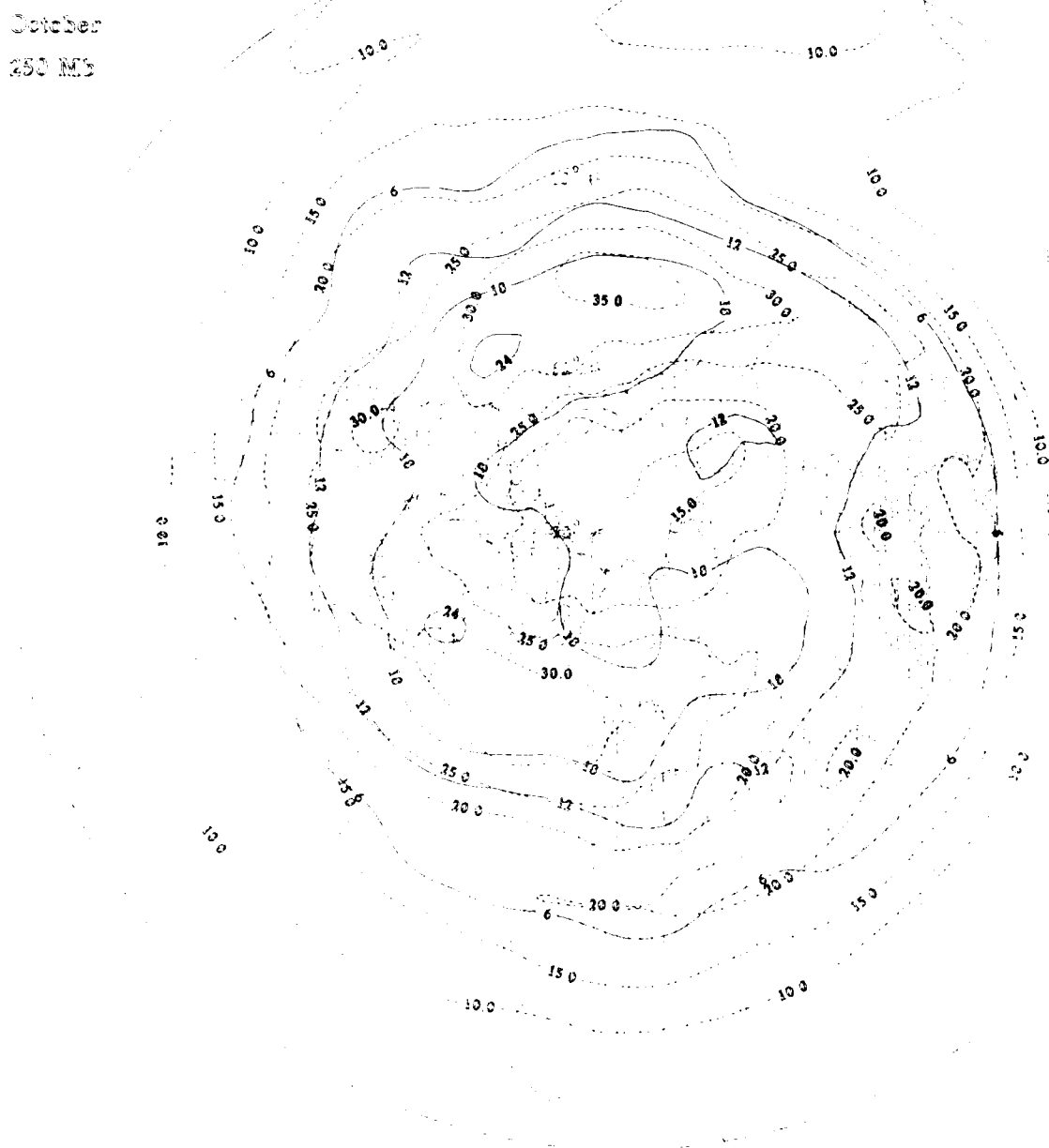
Vector Std Dev (kt)

October

250 MB

Upper Air Climatology

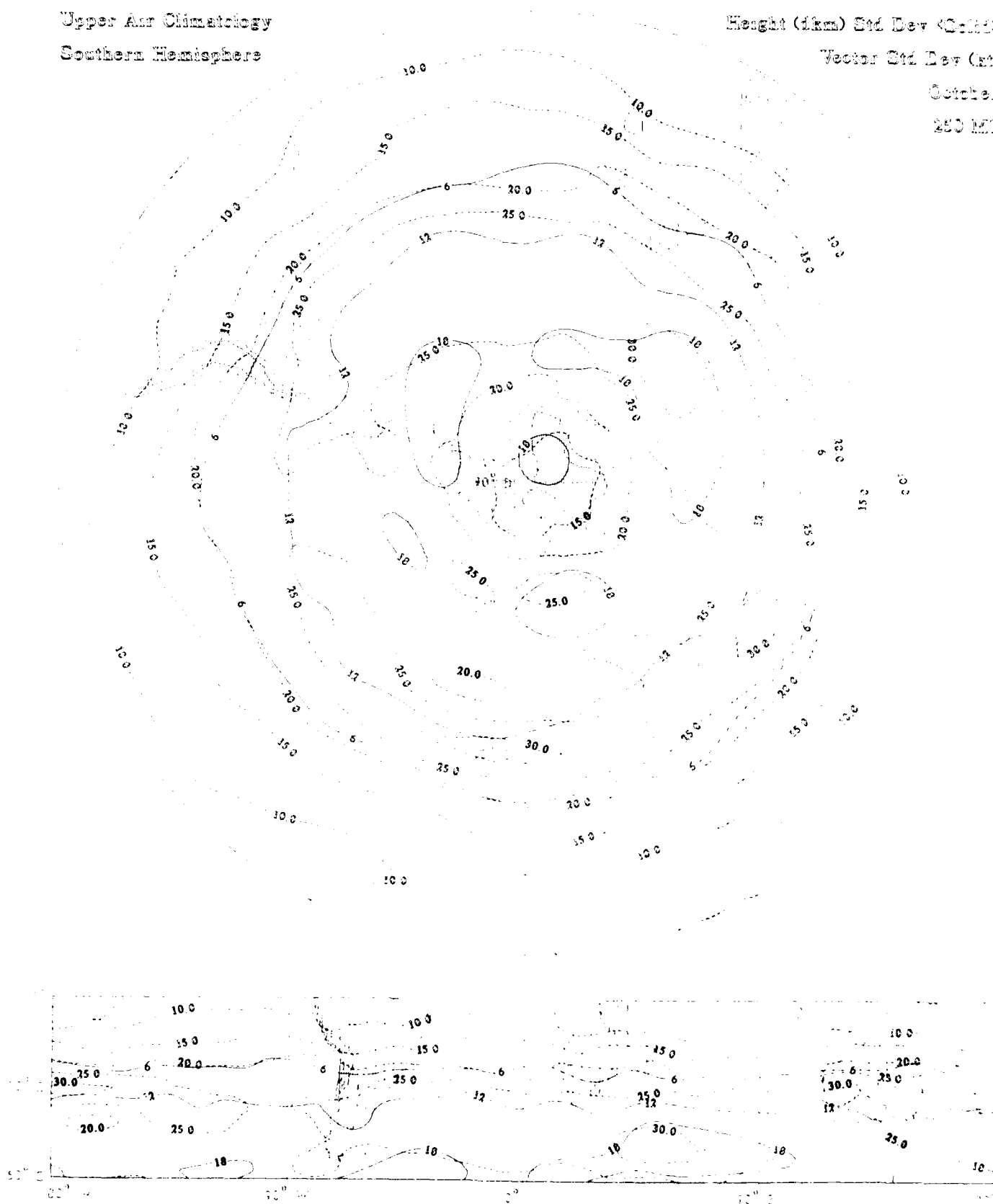
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (1km) Std Dev (Cm)
Vector Std Dev (m)

October
250 hPa



Height (km) Std Dev (Solid)

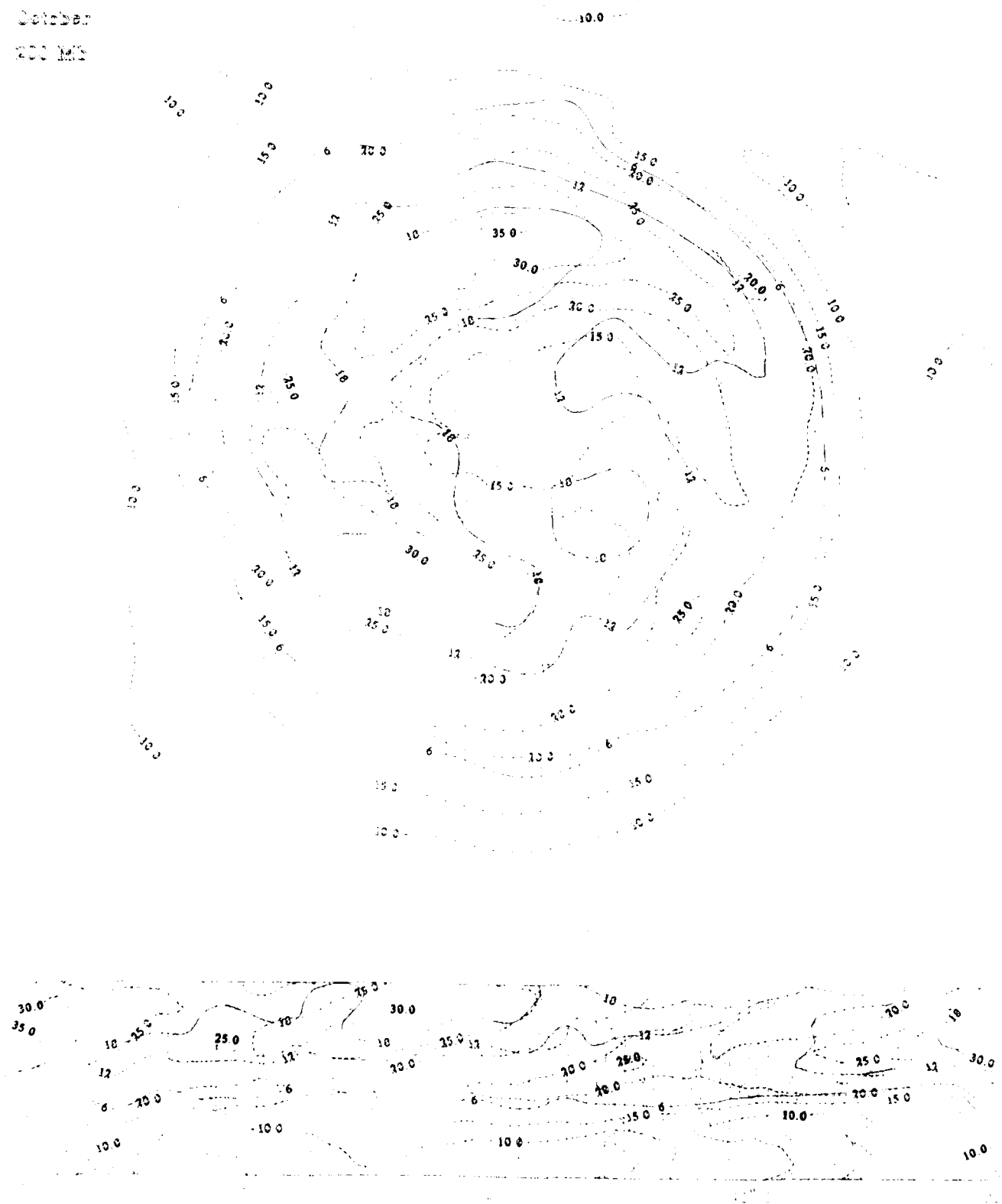
Vector Std Dev (kv)

October

200 MB

Upper Air Climatology

Northern Hemisphere



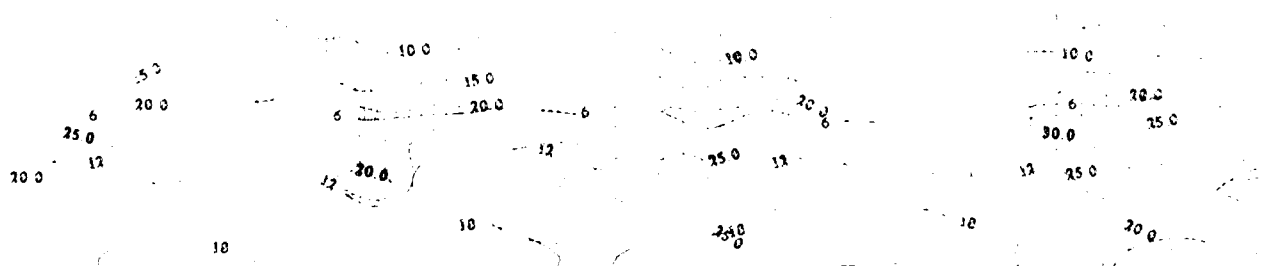
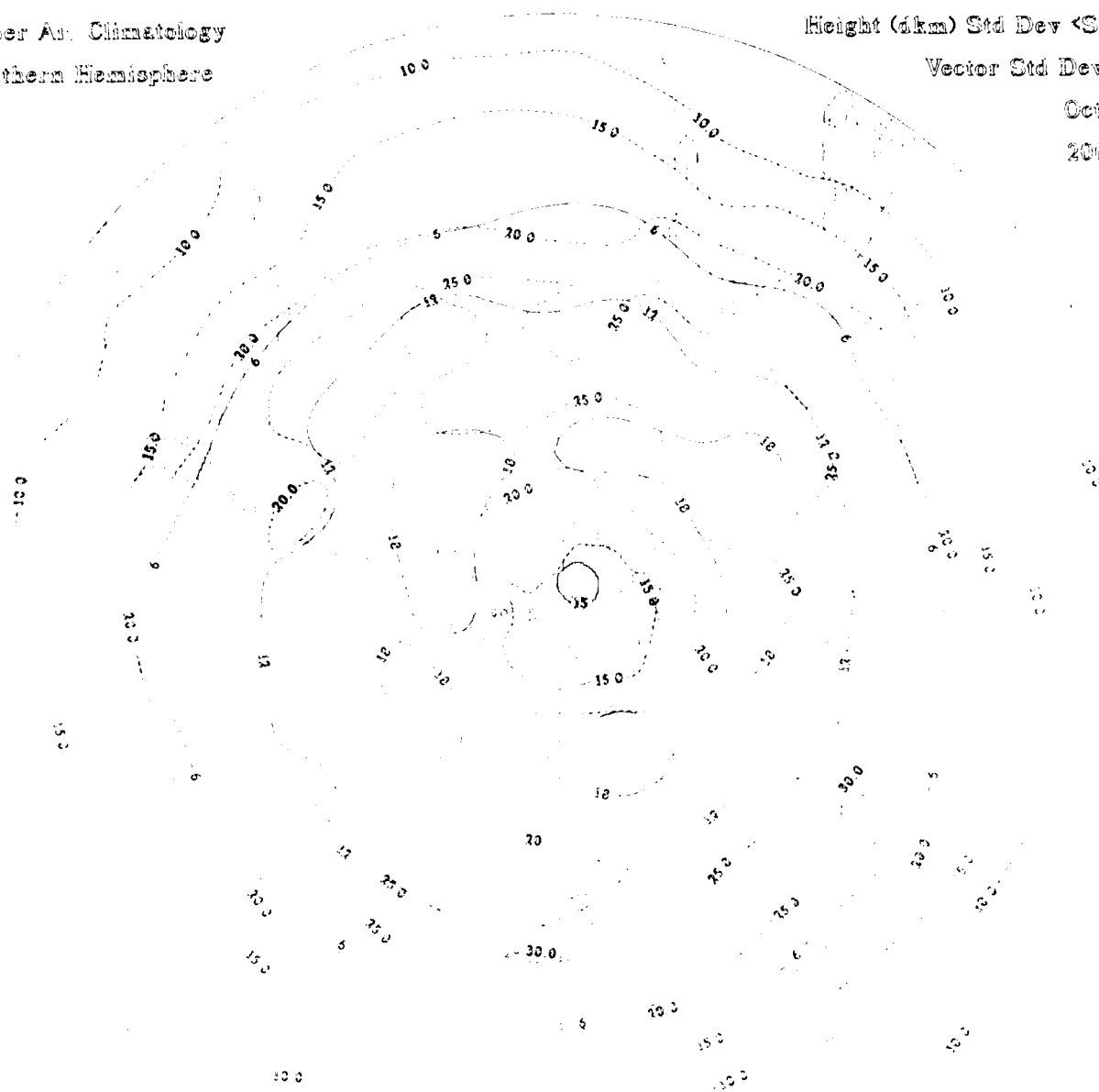
Upper At. Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>

Vector Std Dev (kt)

October

200 MB



Height (dkm) Std Dev <Solid>

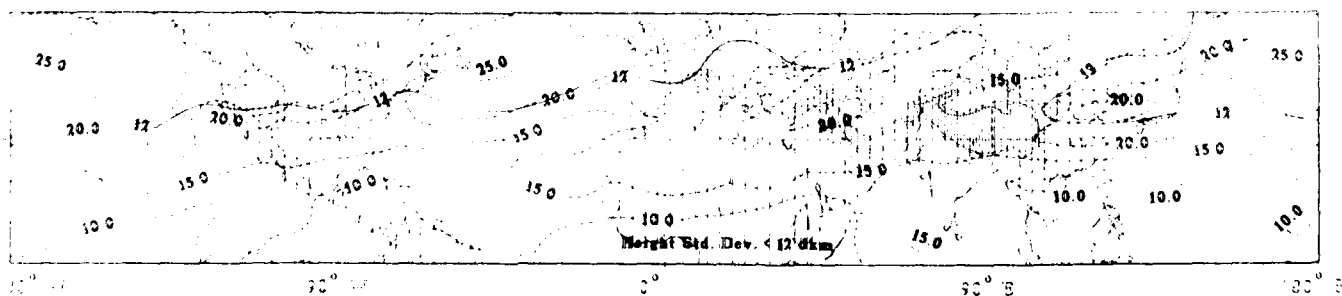
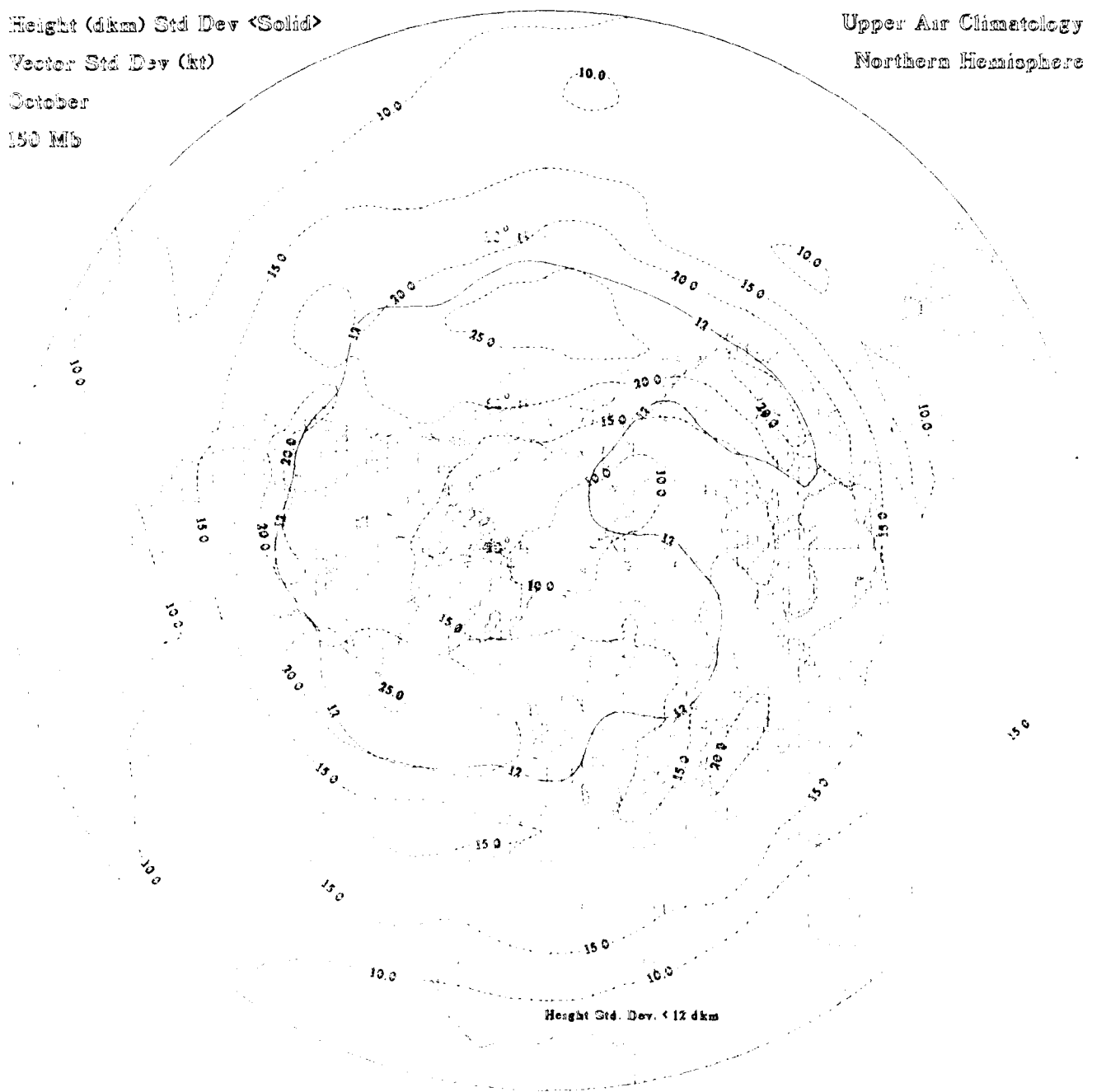
Vector Std Dev (kt)

October

150 MB

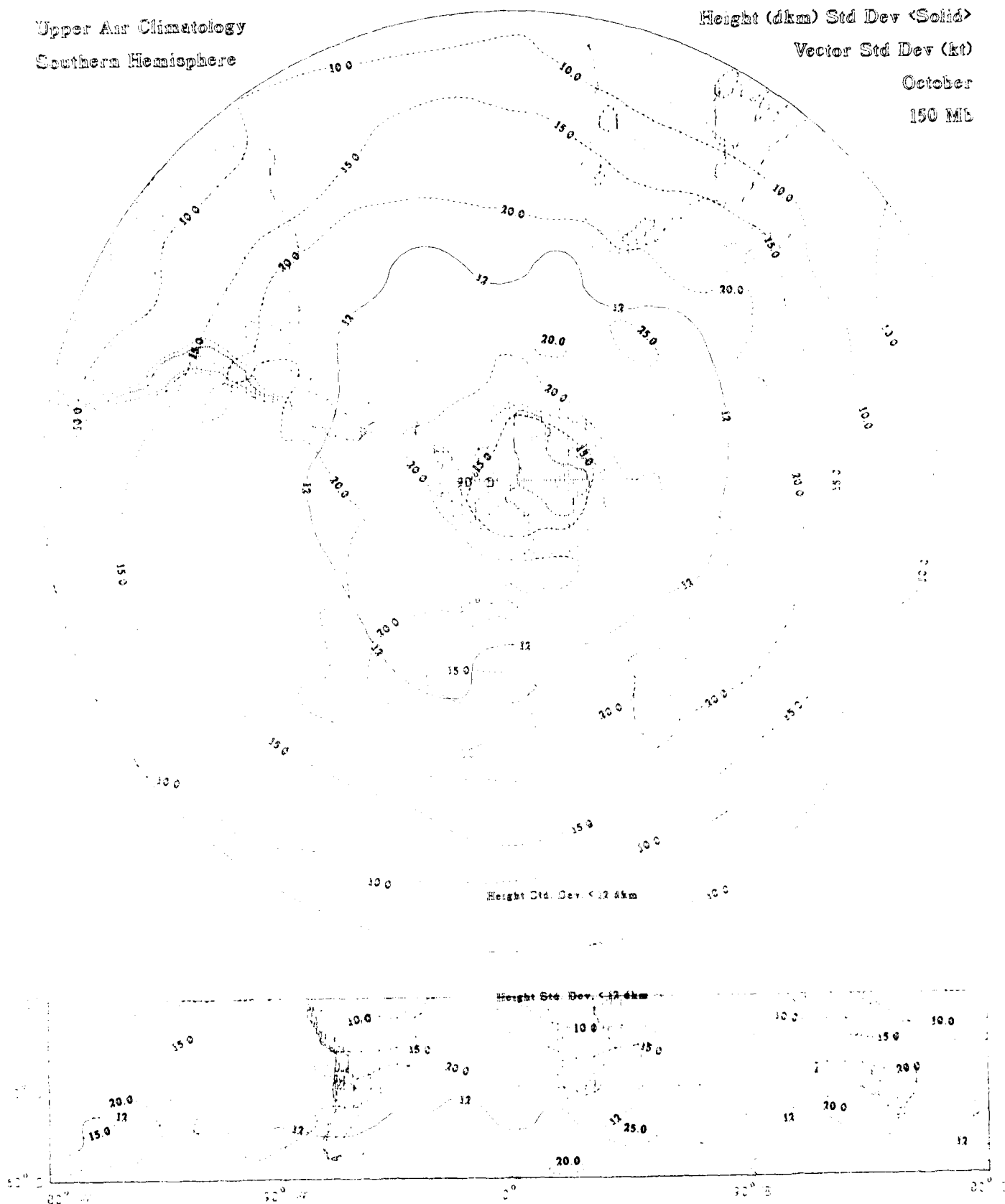
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
150 MB



Height (dkm) Std Dev <Solid>

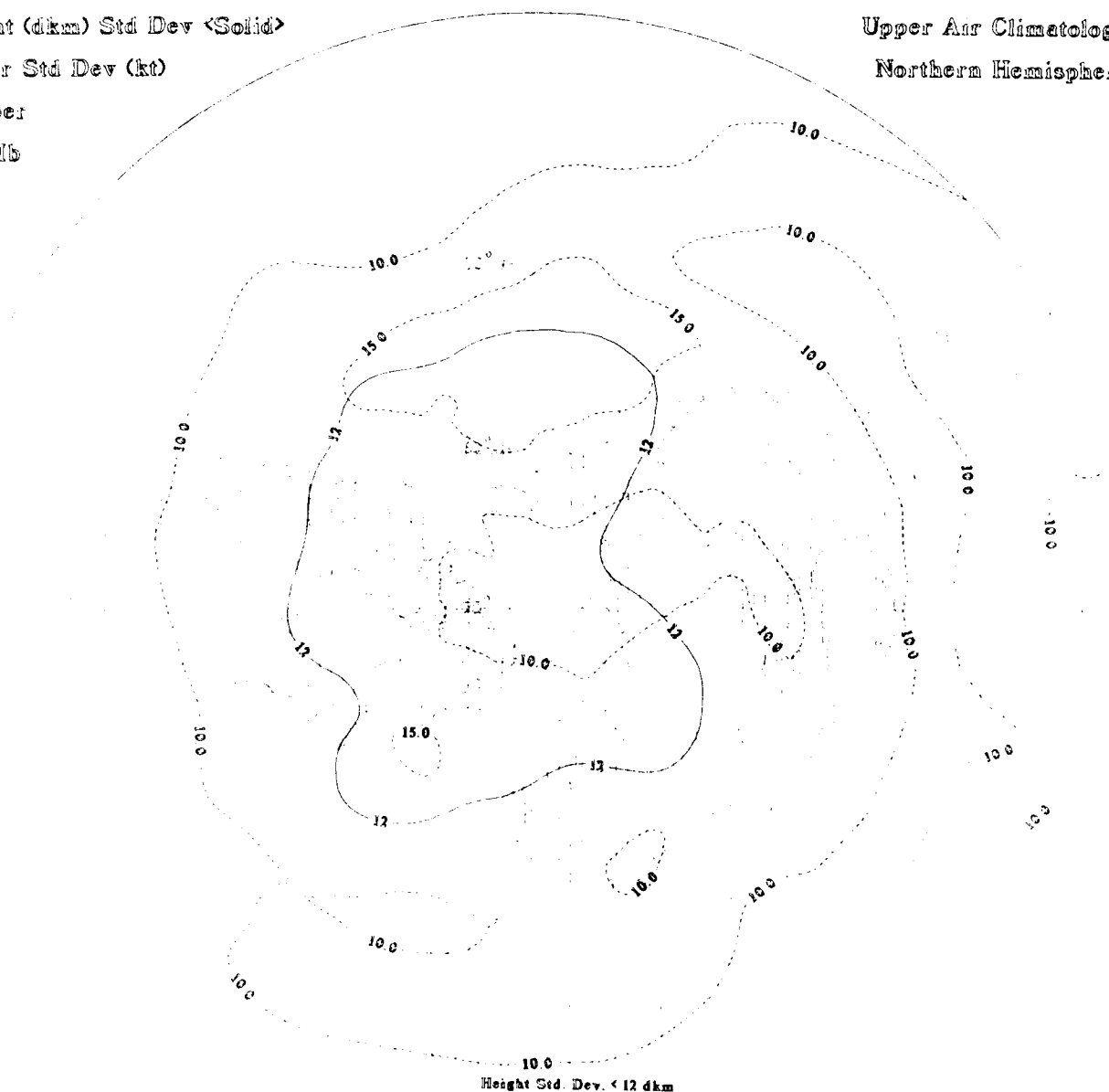
Vector Std Dev (kt)

October

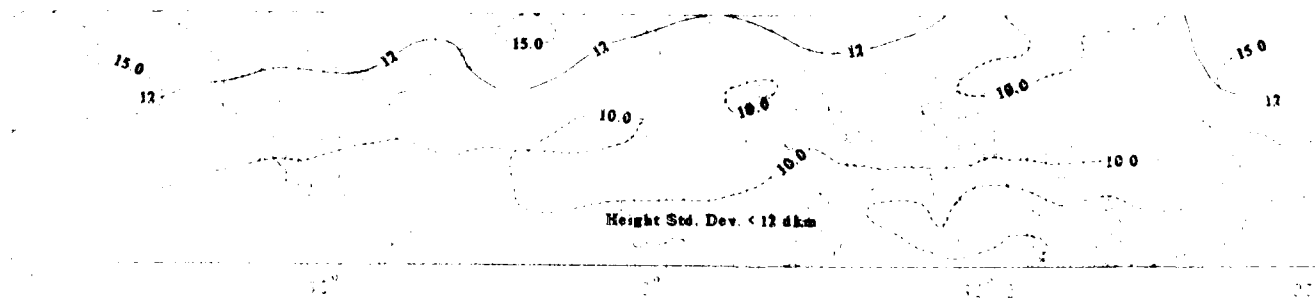
100 Mb

Upper Air Climatology

Northern Hemisphere



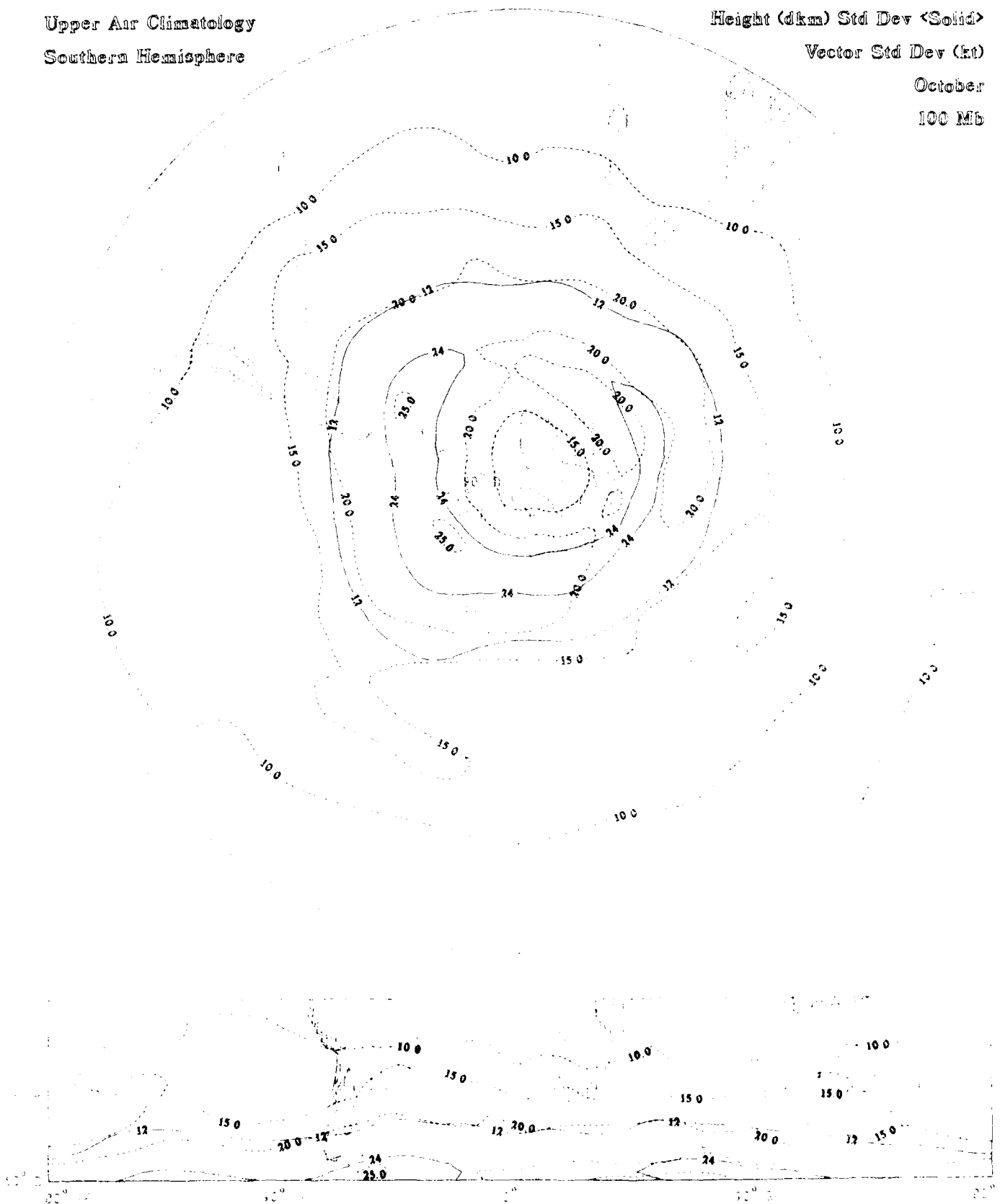
Height Std. Dev. < 12 dkm



Height Std. Dev. < 12 dkm

Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
100 Mb



Height (dkm) Std Dev <Solid>

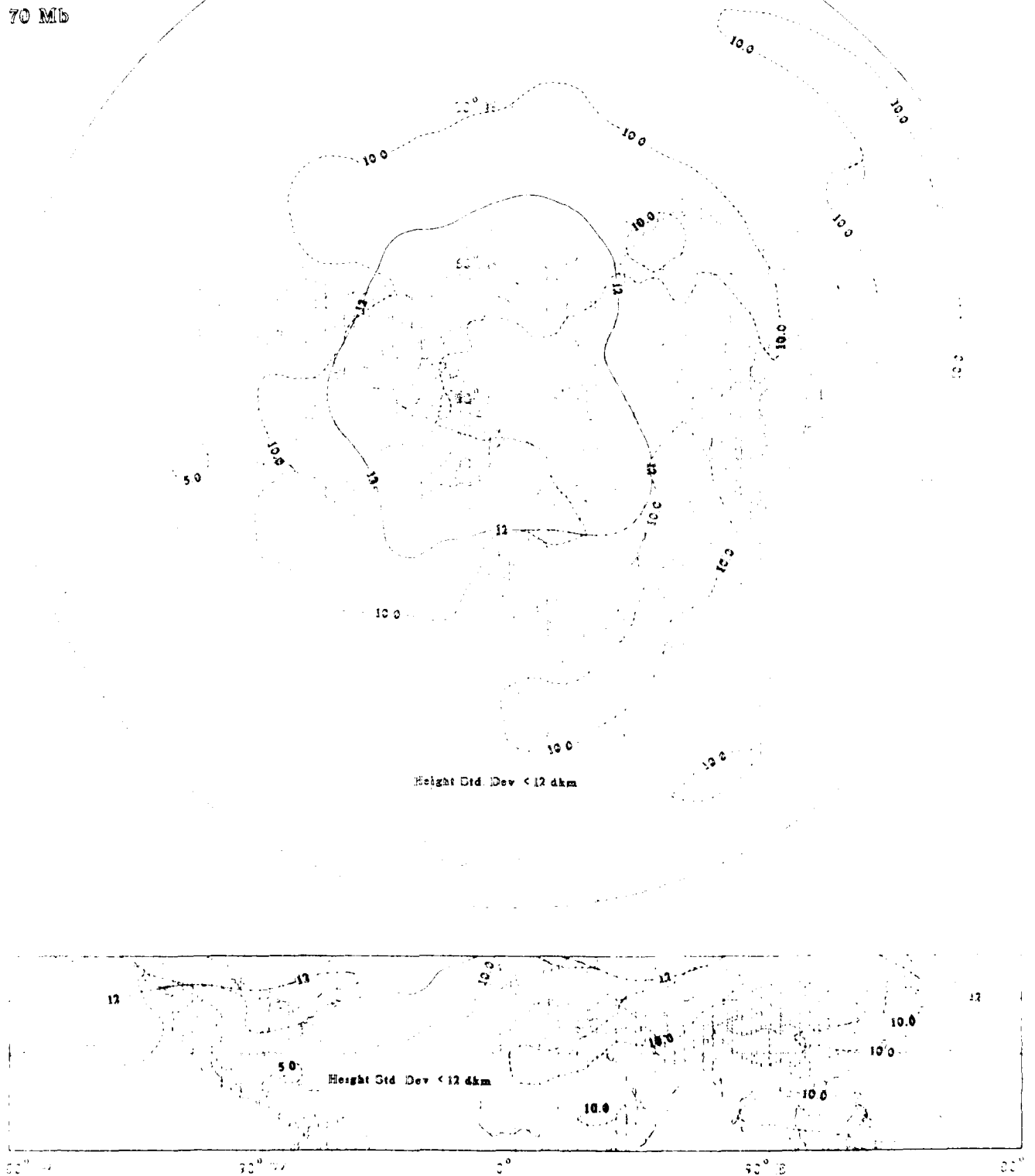
Vector Std Dev (kt)

October

70 Mb

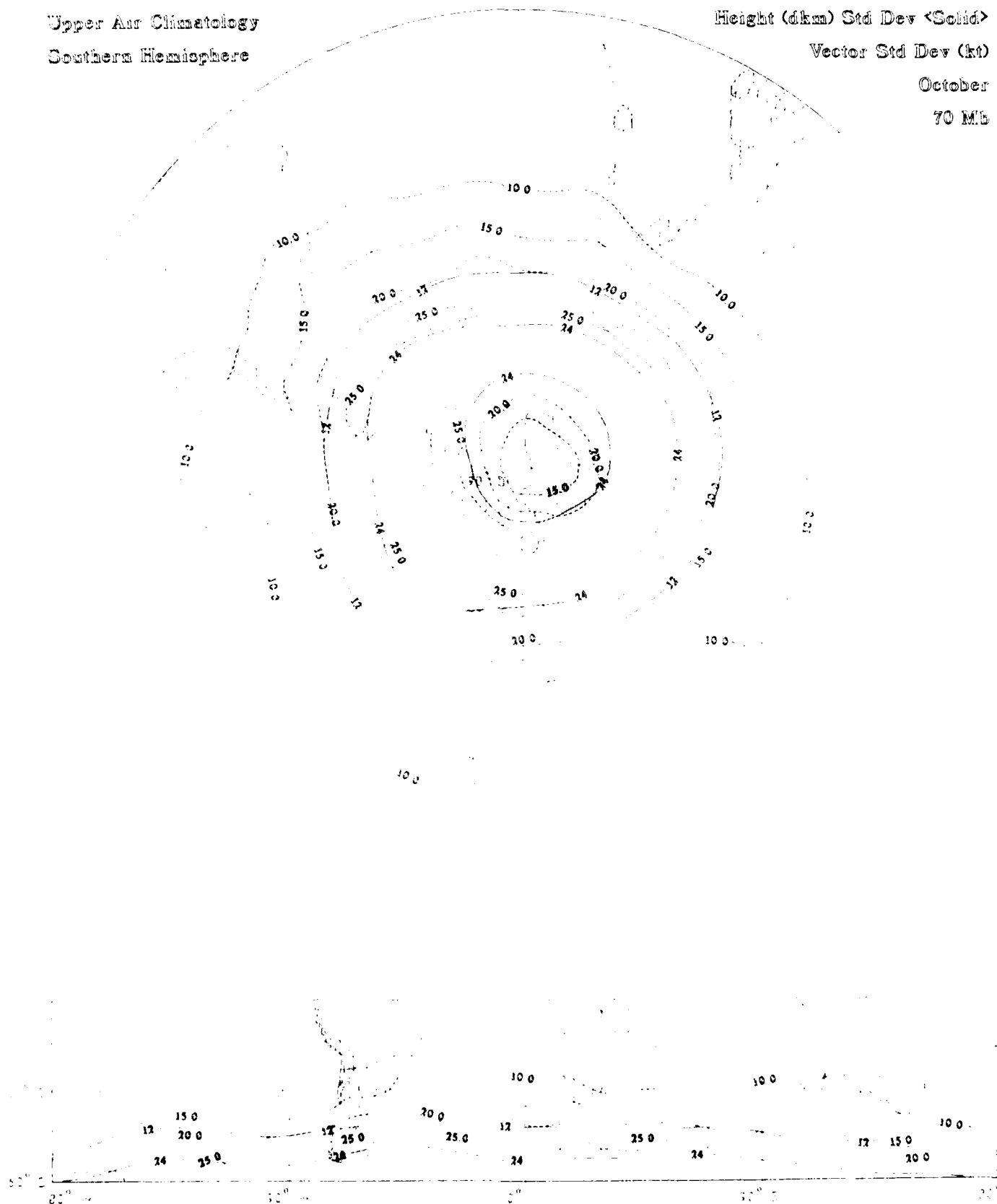
Upper Air Climatology

Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev <Solid>
Vector Std Dev (kt)
October
70 Mb



Height (dkm) Std Dev <Solid>

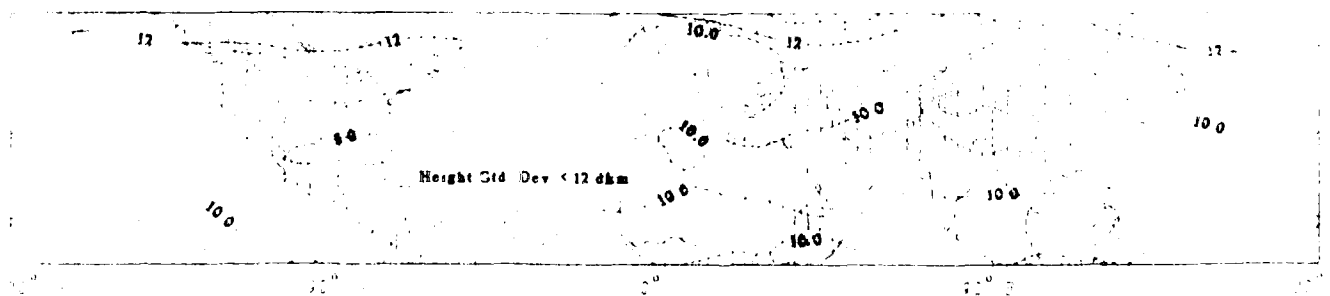
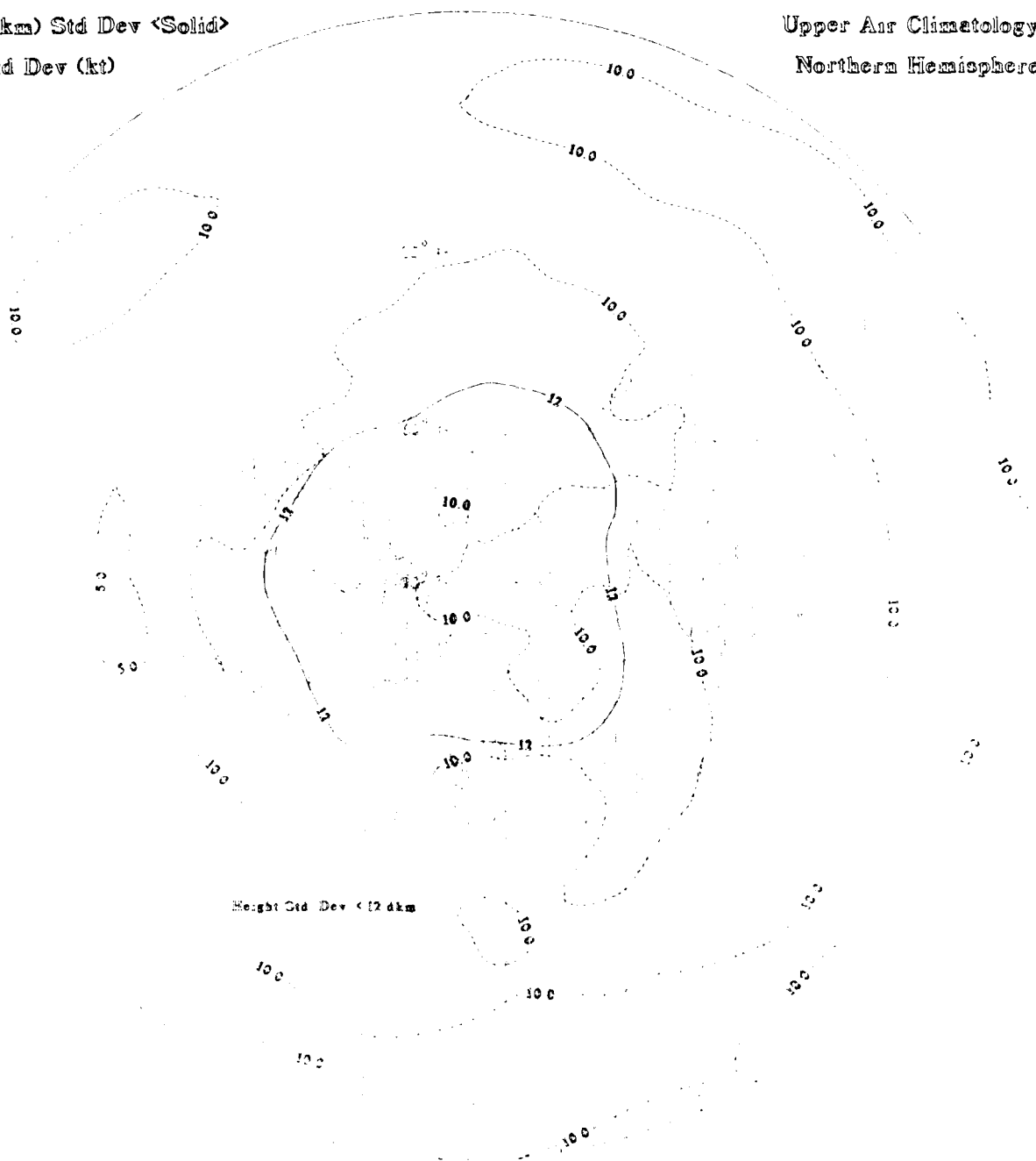
Vector Std Dev (kt)

October

50 Mb

Upper Air Climatology

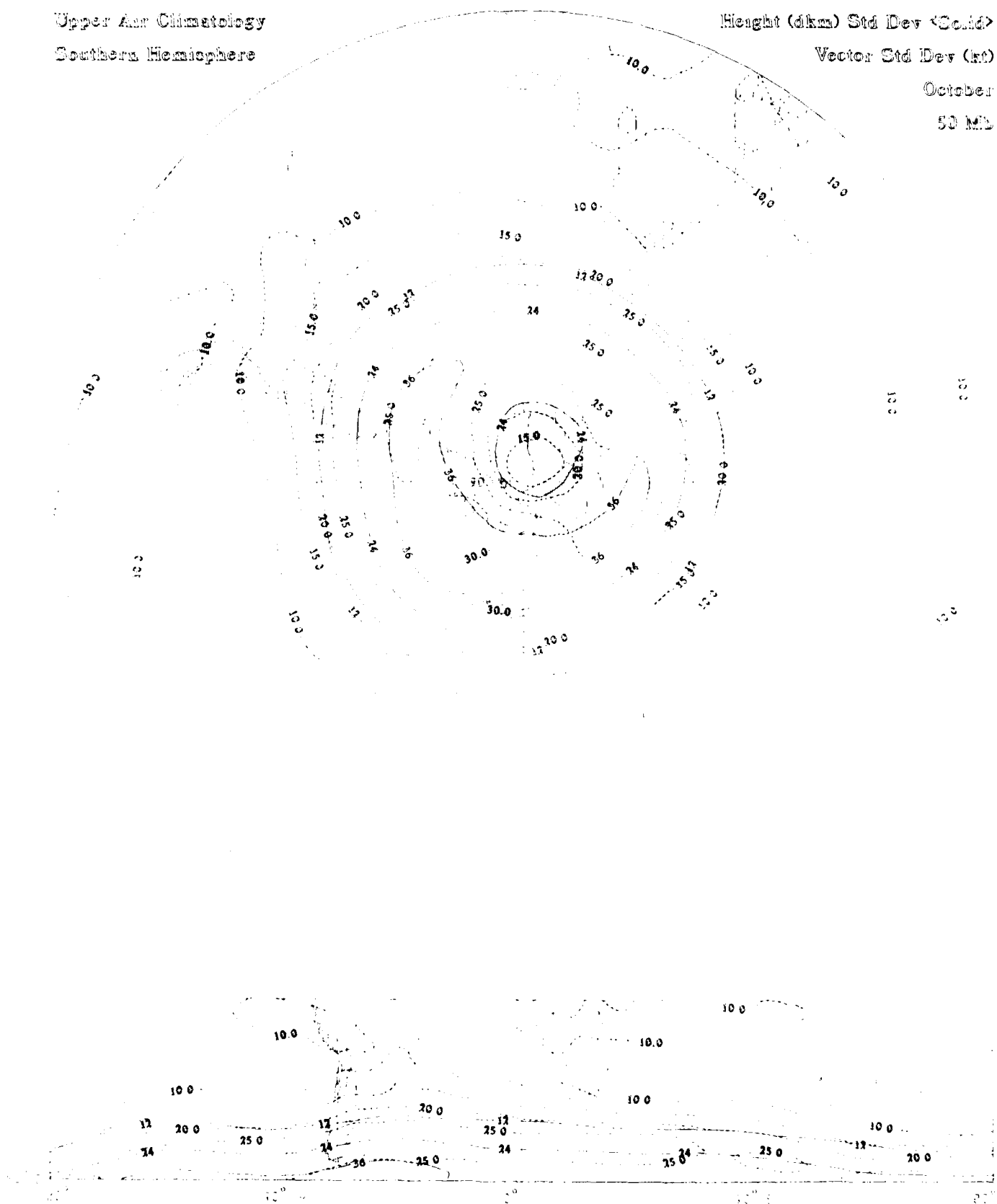
Northern Hemisphere



Upper Air Climatology
Southern Hemisphere

Height (dkm) Std Dev (Solid)
Vector Std Dev (ht)

October
50 MB



Height (dkm) Std Dev (Solid)

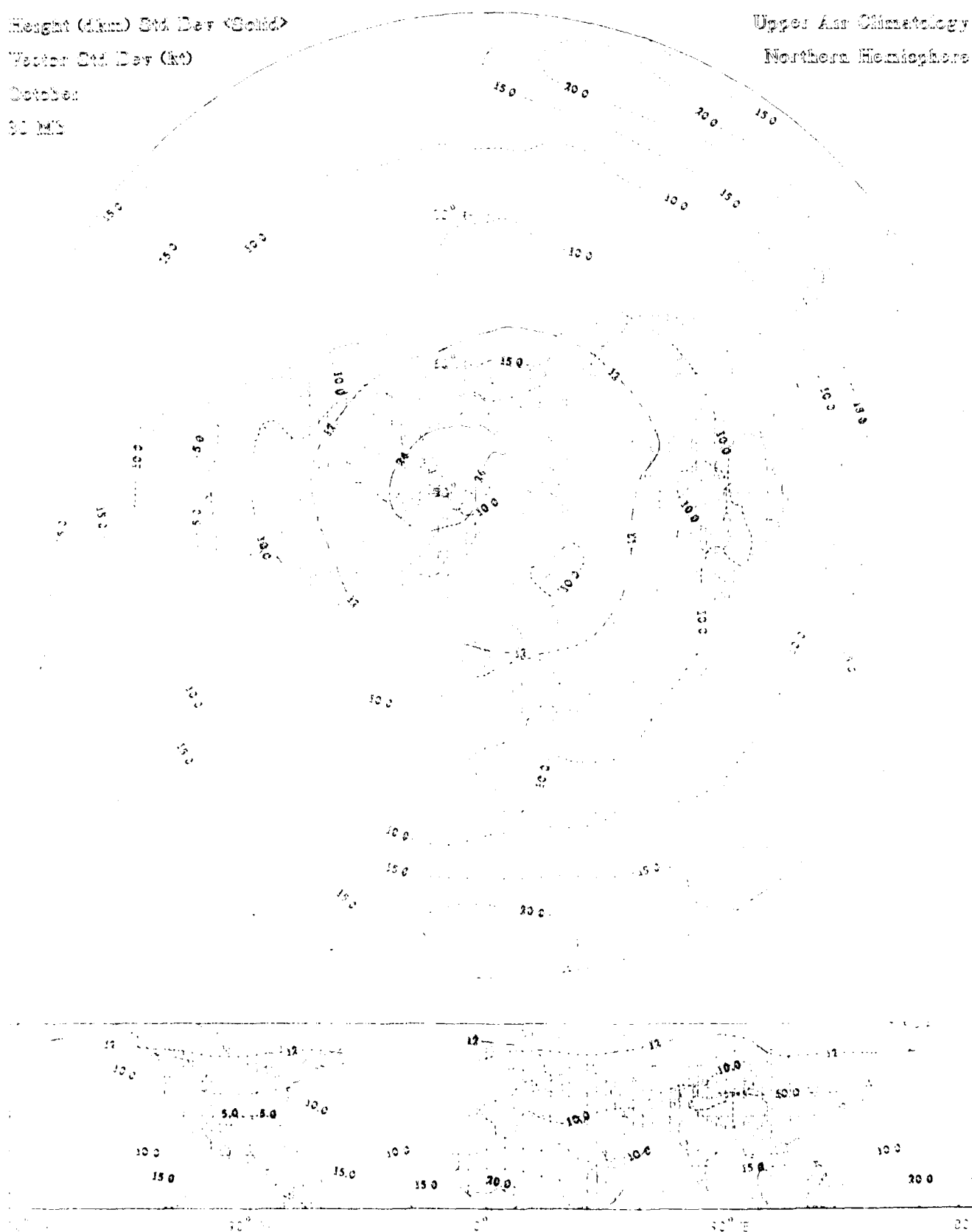
Vector Std Dev (kt)

October

30 MB

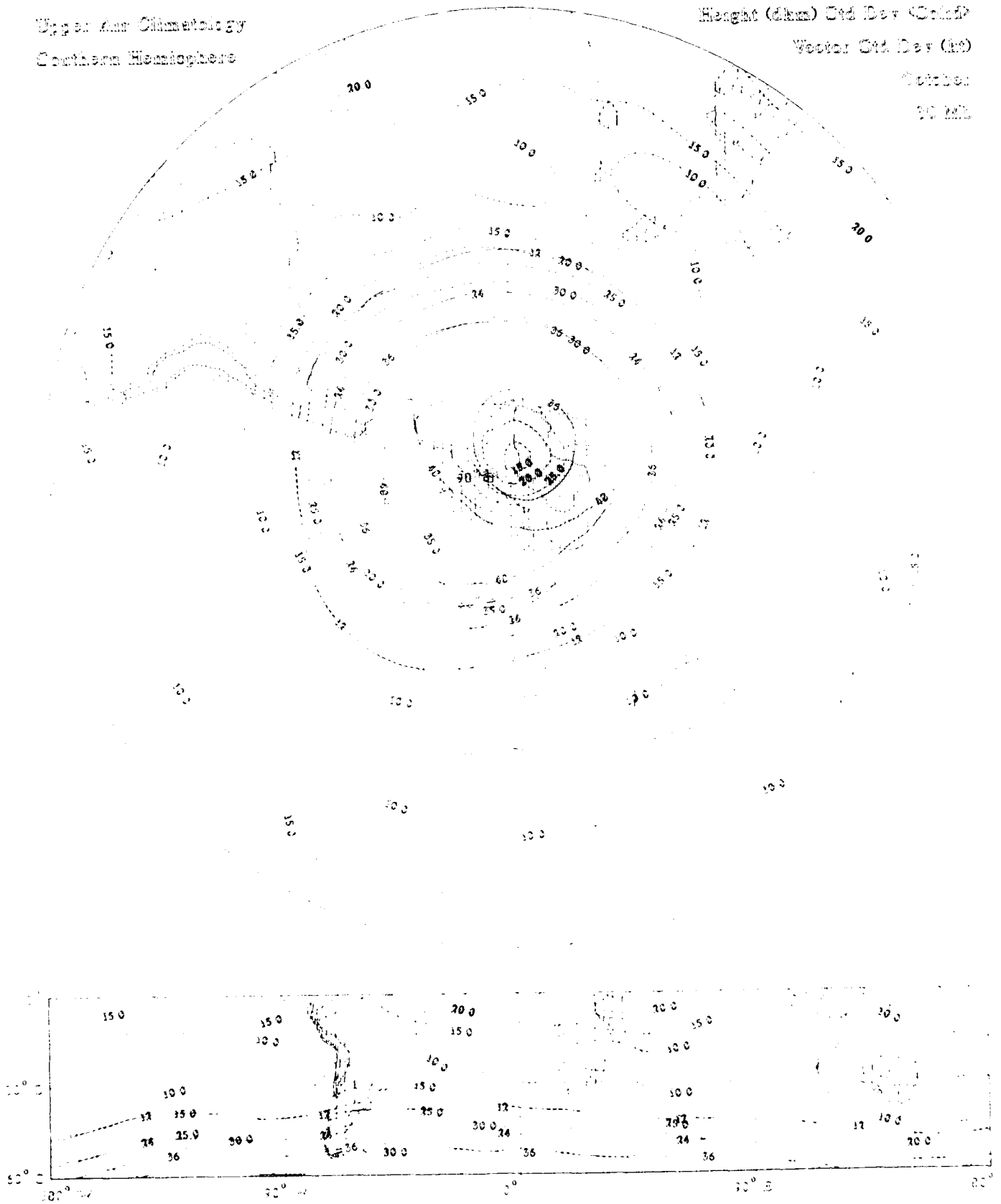
Upper Air Climatology

Northern Hemisphere

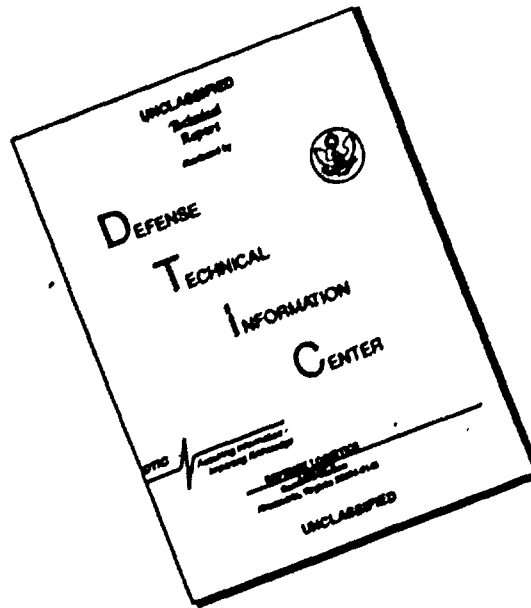


Upper Air Climatology
Northern Hemisphere

Height (gkm) Std Dev (km)
Vector Std Dev (m)
October
10 1952



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