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# WORLD MAGNETIC SURVEY DATA


BY

S. HENDRICKS

AND

J. C. CAIN


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GODDARD SPACE FLIGHT CENTER

GREENBELT, MD.


SPT-10836

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ABSTRACT

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The distributions of magnetic survey information available from all sources since 1900 is analyzed. The data are tallied according to the distribution by area and decade and by the component measured. The positions of observatory, possible repeat stations and all other data are mapped on world charts. The deficiencies in coverage are noted and recommendations for the IQSY are made. AUTHOR

## I. Introduction

This is one of a continuing series of reports prepared to assess our knowledge of the main geomagnetic field on the basis of available survey data. The summary given here is of the total data in a reduced digital form available to us for defining both the field and its secular change.

The purpose of this data collection is to compute an accurate reference field for assisting in the analysis of satellite data. The requirements for the accuracy and detail of this field are sufficiently stringent that a successful determination should satisfy most of the needs of the World Magnetic Survey. Since the satellite data are being obtained continuously it is necessary to determine parameters that will give the field at any epoch instead of the past practice of working from charts given at 5 or 10 year intervals. Consequently, an attempt is being made to rely on original observations rather than those that have been already corrected to a standard epoch by applying an approximate secular change. Since satellites operate above 200 km altitude it is unnecessary to obtain surface data at much less than 100 km intervals over the earth's surface. However, the initial collection is being made of all available data with the intent that later smoothing or selection can be effected.

## II. Sources

The main responsibility for the collection, editing and formating of these data onto punched cards has been carried out by the Magnetic Division of the U. S. Coast and Geodetic Survey. The data used in this report comprises the punched card set from which the U. S. 1965 World Magnetic Charts are to be constructed. The cut-off date selected was the year 1900 since there is only a small quantity of data prior to this century. The 567 sources of data are quite diverse and can only be categorized according to type with special mention of only a few. These categories are listed below with the code classification numbers adopted by the U. S. Coast and Geodetic Survey:

| Code | Type of Observations |
|---|---|
| 0 | Observatory |
| 1 | Land ("Field") |
| 2 | Aeromagnetic |
| 4 | Shipboard |
| 5 | Satellite |
| 6 | Ship towed |
| 9 | Repeat stations (exact reoccupations) |

Most of the data coverage in recent years has arisen from the (code 2) aeromagnetic surveys. The major contributor has been the "Magnet" project of the U. S. Naval Oceanographic office. A second source has been the outstandingly complete survey of Canada being carried out by the department of Mines and Technical Surveys. The reduction of these

data to punched cards was essentially carried out by the originating organization. Valuable data in "sparse data" areas have been recently obtained in polar regions by the University of Wisconsin with their total field airborne surveys and in the southern oceans by the Columbia University ship "Vema" (total field only) and the U.S.S.R. non-magnetic ship "Zarya".

## III. Processing of the data

Because of the use of original observations plus the fact that an overly high density was undesirable, some editing and processing was done on the original data set. The reduction in density by selection over 20 or 30 km intervals was done on some of the airborne data. This processing was done at Goddard Space Flight Center and the resultant data turned over to the U. S. Coast and Geodetic Survey for incorporation into their punched card files.

Other detailed editing for various categories of data are as follows:

(1) Project Magnet - Since the nearest to original observations for this airborne survey are the components F (total field), D (declination), and I (inclination), the H (horizontal) and Z (vertical) derived data were eliminated. The data as obtained from the U.S. Coast and Geodetic Survey cards did not include the time of the observation on a given date. In order to make these records complete for possible future use, the hour and minute of each observation was merged into the data from information received directly from the U. S. Naval Oceanographic Office.

(2) Canadian Airborne Survey - The components H, D and Z were selected from these data as the original observations. The data had been reduced to sea level by a dipole relation and the time and altitudes deleted from the cards. This missing information was added by reference to an original card set received from Canada and the H and Z data were restored to flight altitude.

(3) Land Observations - The data contained many observations that were likely redundant in that they were computed from other data already included in the set. For example, the vertical component is often given as an observation even though it was derived from readings of H and I also appearing. Using information from the U. S. Coast and Geodetic Survey, the various redundant information was eliminated from a selection of sources.

Aside from the above detailed editing by type, it was also necessary to perform a large amount of processing in order to make the original punched card set compatible with a standard format on magnetic tape for use in an electronic computer.

## IV. Distributions of Data

The distributions of all data can be represented in many different ways since the data can be grouped by epoch, component, position, altitude, code, etc.. Rather than making a comprehensive catalogue, we instead list and illustrate these distributions in a relatively small number of

ways so as to obtain a more concise picture of the nature of the data.

The present (two) data tapes include 203407 records for a total of 450149 observations of component (H, D, I, Z) or total field (F). The distribution of the number of observations for each component in blocks of $10^{o}$ x $10^{o}$ in latitude and longitude is given in Tables 1 a-e. Longitude numbers refer to the eastern boundary of the block (i.e. the longitude block labeled 160 extends from $170^{o}$W to $160^{o}$W ). The values from these five tables were combined to give the totals which appear in Table 1 (f).

Table 2 gives the number of observations for each component by year. Due to the increase in activity in airborne surveys, the data rate has jumped by an order of magnitude in the past decade. Nevertheless, the total data set is still predominantly surface observations as shown by Table 3. The altitudes of the airborne data range from near the surface almost to 8 km with the most popular altitude between

Table 3

| | D | I | H | Z | F | SUM |
|---|---|---|---|---|---|---|
| Surface | 121,873 | 63,638 | 74,651 | 36,694 | 11,891 | 308,747 |
| Airborne | 39,317 | 36,327 | 10,932 | 11,211 | 40,819 | 138,606 |

2 and 3 km. The only data from a higher altitude are those 2797 observations provided by the Vanguard III satellite (510-3750 km).

## V. Densities of Data

The large difference between the amount of surface area covered by a $10^{\circ}$ square at the equator and a similar square in polar regions made it desirable to use another method for illustrating distributions. The number of square kilometers in each block was calculated using the formula:

$$A = \frac{2\pi R^2}{360 / \Delta\varphi} \left[\sin(\theta + \Delta\theta) - \sin\theta\right]$$

where R (earth's radius) was taken to be 6371.2 km, $\Delta\varphi$ and $\Delta\theta$ were $10^{\circ}$, and $\theta$ was the latitude of the southern boundary of the block. These areas are listed in Table 4. The values from Table 1 (f) ( all data ) are modified by dividing by A and the results given in Table 5a in units of observations $/10^5$ $km^2$. Thus, for an equatorial block, where one degree equals 111 km, a value of 1000 for a $10^{\circ}$ block would represent data points at an average of approximately 10 km intervals. It can be seen from the figure that the density in areas near the magnetic poles compares favorably with that over most of the larger land masses. Table 5b gives similar results for the period since 1955. It is quite apparent that if the objective of the World Magnetic Survey is to be a point density never less than 12 obs/$10^5 km^2$ (a 100 km spacing), far less than half of the earth has been covered in this decade.

A more graphic illustration of the density of the data is given in Figures 1a to 1f. Here are plotted the positions of the data for the periods of years indicated. The only grouping is into blocks of

$0.5 \times 0.5^{o}$ of latitude and longitude to conserve plotting time. That is, each such block is dotted once if any observation falls within it.

One of the most striking aspects of these data distributions is the relative uniformity of the data over the ocean areas up to about 1930 and the almost complete lack until the present decade. The average of data in the Arctic has been almost non-existent until the 1935-45 period and very heterogeneous since. The amount of Antarctic data has been sparse for all periods. The large density of data over the Asian landmass in the interval 1935-1945 arises mainly from a comprehensive compilation made in the Soviet Union and reduced to the epoch of 1940.

## VI. Secular Change

The approach to the problem of determining the secular change has historically been to use observations at a number of land-based observatories and other selected sites. Successive precise observations at exactly the same location have been considered necessary since the small scale ( $<$ 50 km) irregular fluctuations of the field over short distances ( 1-500 meters) are often larger than the secular changes over a period of several years. The locations of the magnetic observatories for which data are available since 1900 are plotted Figure 2. The names of some of these observatories are listed on the map as allowable from the space available.

The identification of a repeat station has been more difficult since the information was not listed on the original cards for any but

a small fraction of the stations, mainly those in the United States. Thus the Code 1 data on the tapes are thought to contain a number of repeat stations. In an effort to select what may be repeat stations from the data, a list was compiled from Code 1 and Code 9 data with the criteria that the listed location be identical for 2 or more observations one or more years apart. The resulting list of observations is plotted in Figure 3a. The large density in certain areas here has resulted in the fact that most of the observations are listed to only the nearest minute of latitude and longitude. Thus, any point within a distance of the order of a kilometer is dotted as a repeat station. The figure obviously contains a sizeable factor of points beyond the number of actual stations. It does however, indicate the areas devoid of such stations. Figure 3b was prepared by imposing the additional criteria that the last observation be later than 1930 and that the total observations be 3 or more. This figure is thought to be more representative of the actual distributions of these stations.

## VII. Recommendations

Referring to Tables 5b and Figures 1, the need for data coverage during the present decade becomes quite clear. To meet the minimum criteria of a 100 km spacing, it is necessary for the point densities in the blocks of Table 5b to exceed 12 obs/ $10^5$ $km^2$. It would seem reasonable then to assess these "sparse areas" with priorities based on the present density and recentness of past observations. The major efforts of the WMS should then be made in these areas.

It is hoped that this document may be helpful not only in directing the needs for additional surveys, but also in bringing forth data taken but not generally available.

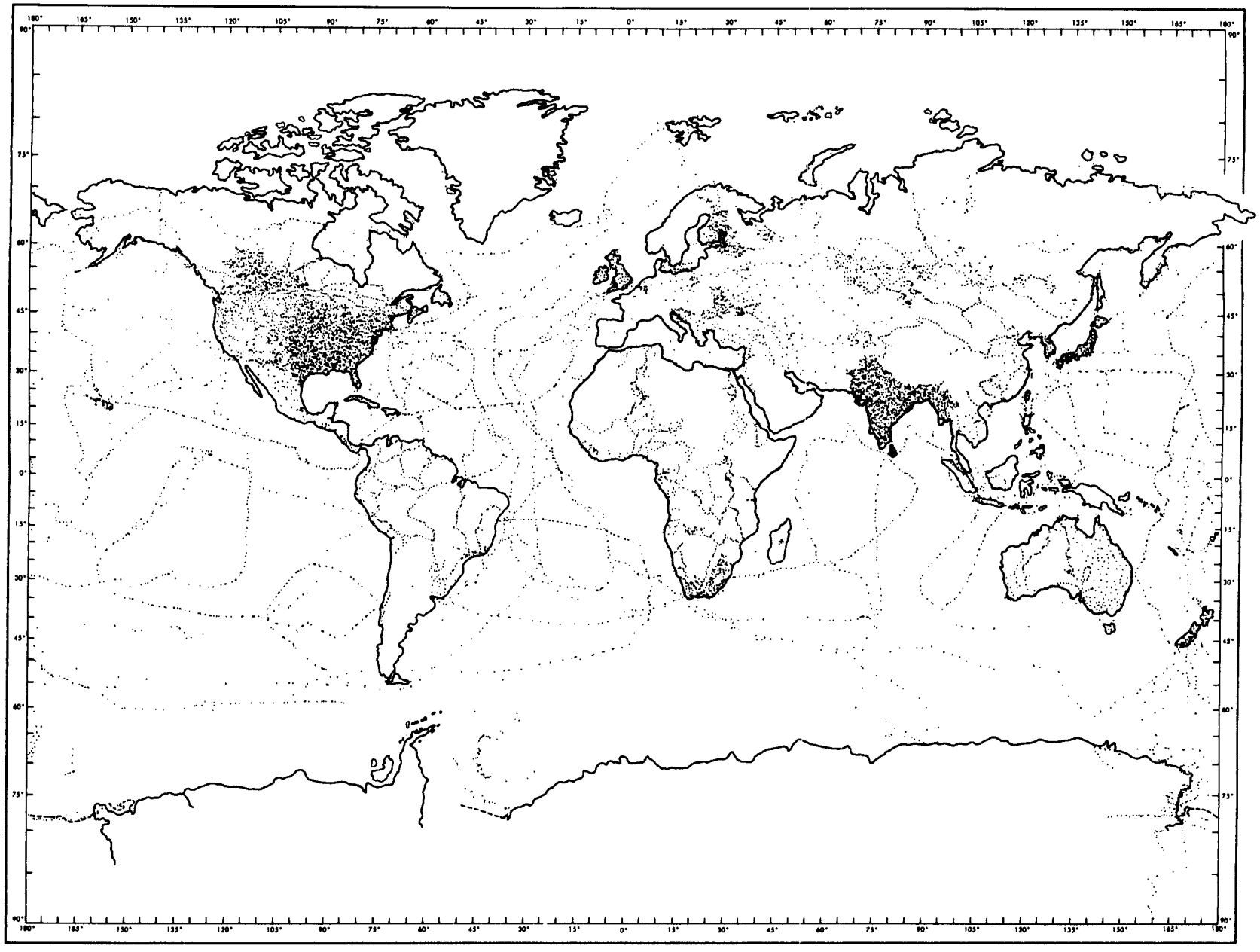

Figure 1(a) Magnetic survey observations before 1915

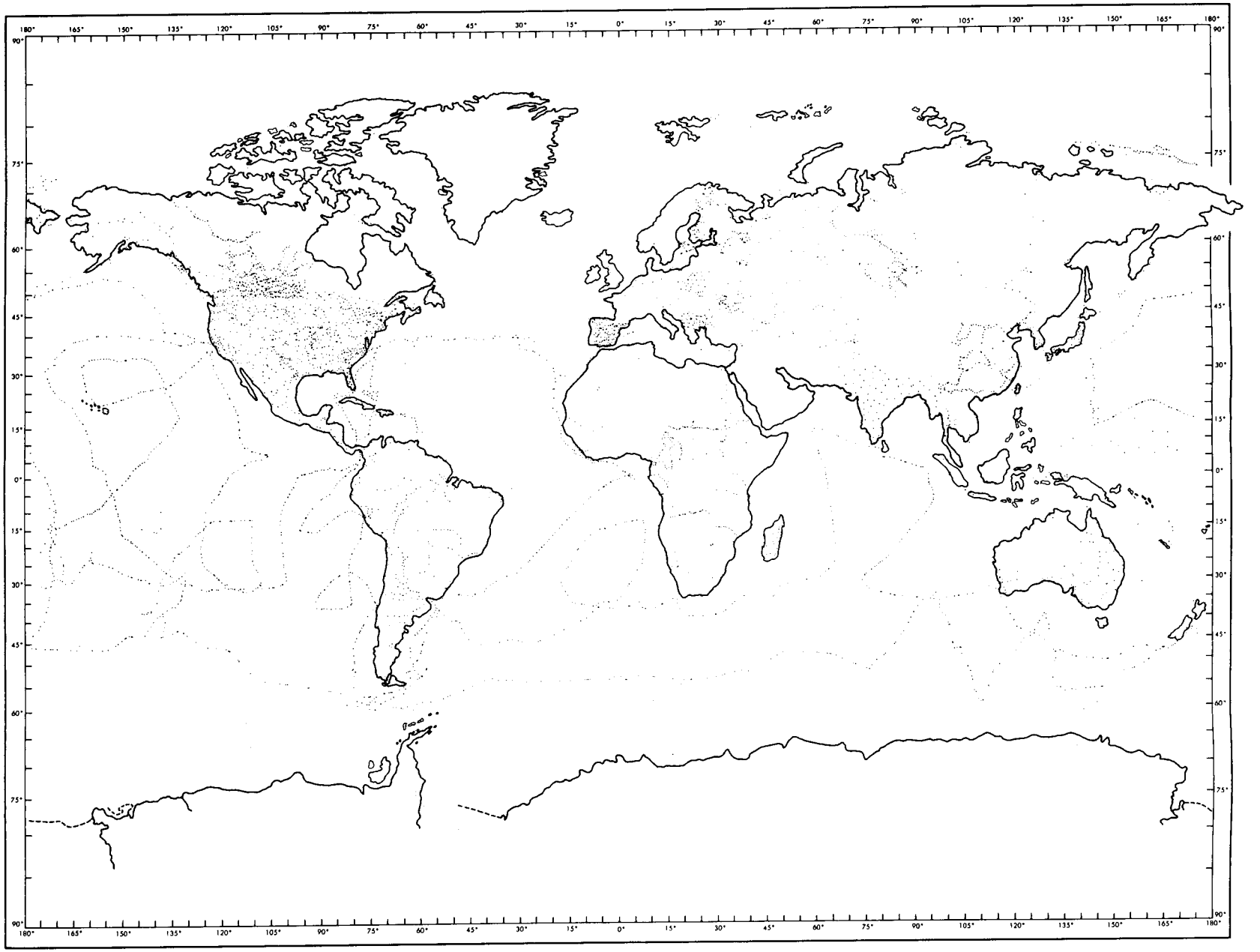


Figure 1(b) Magnetic survey observations from 1915-1925

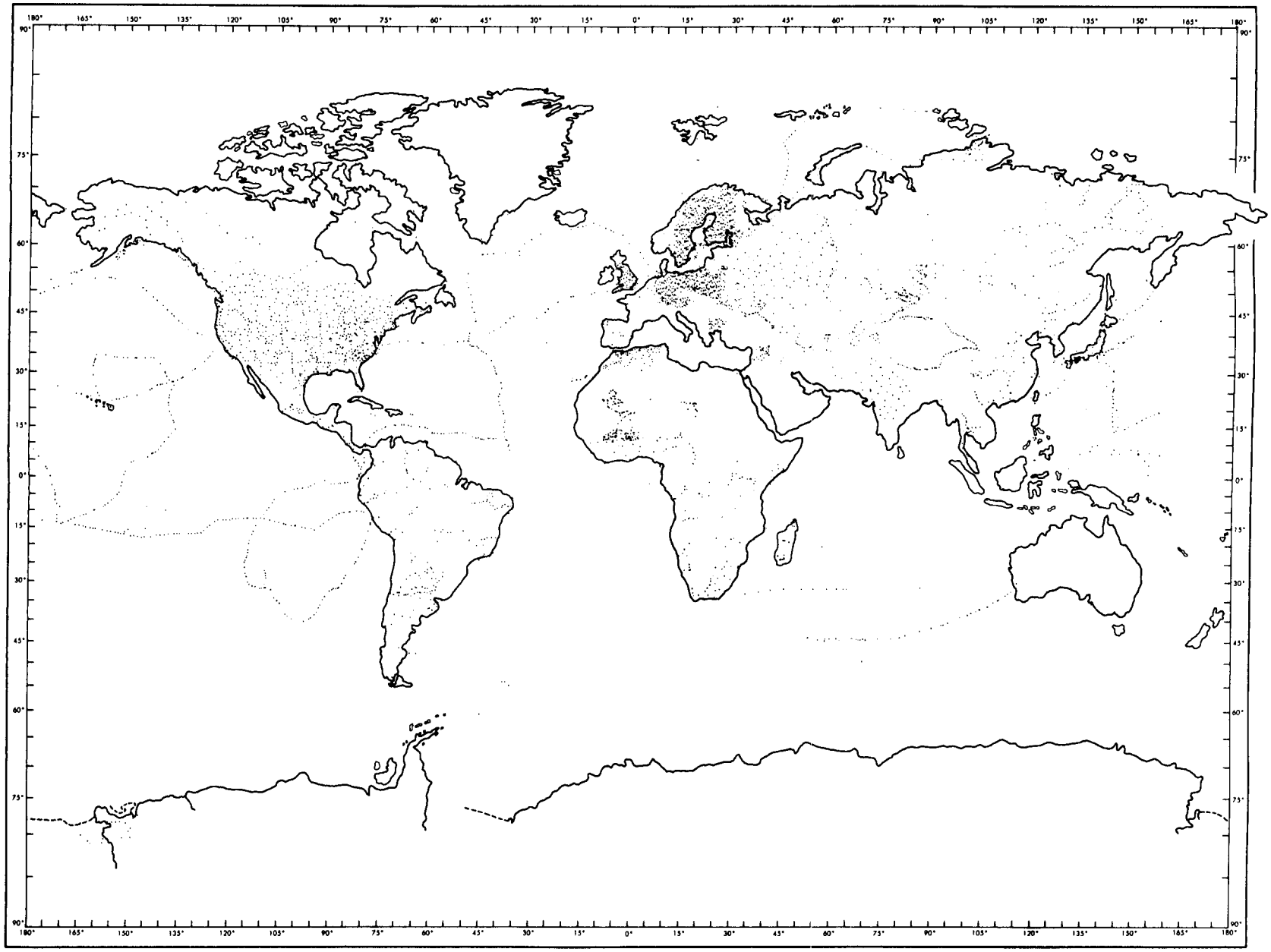


Figure 1(c) Magnetic survey observations from 1925-1935

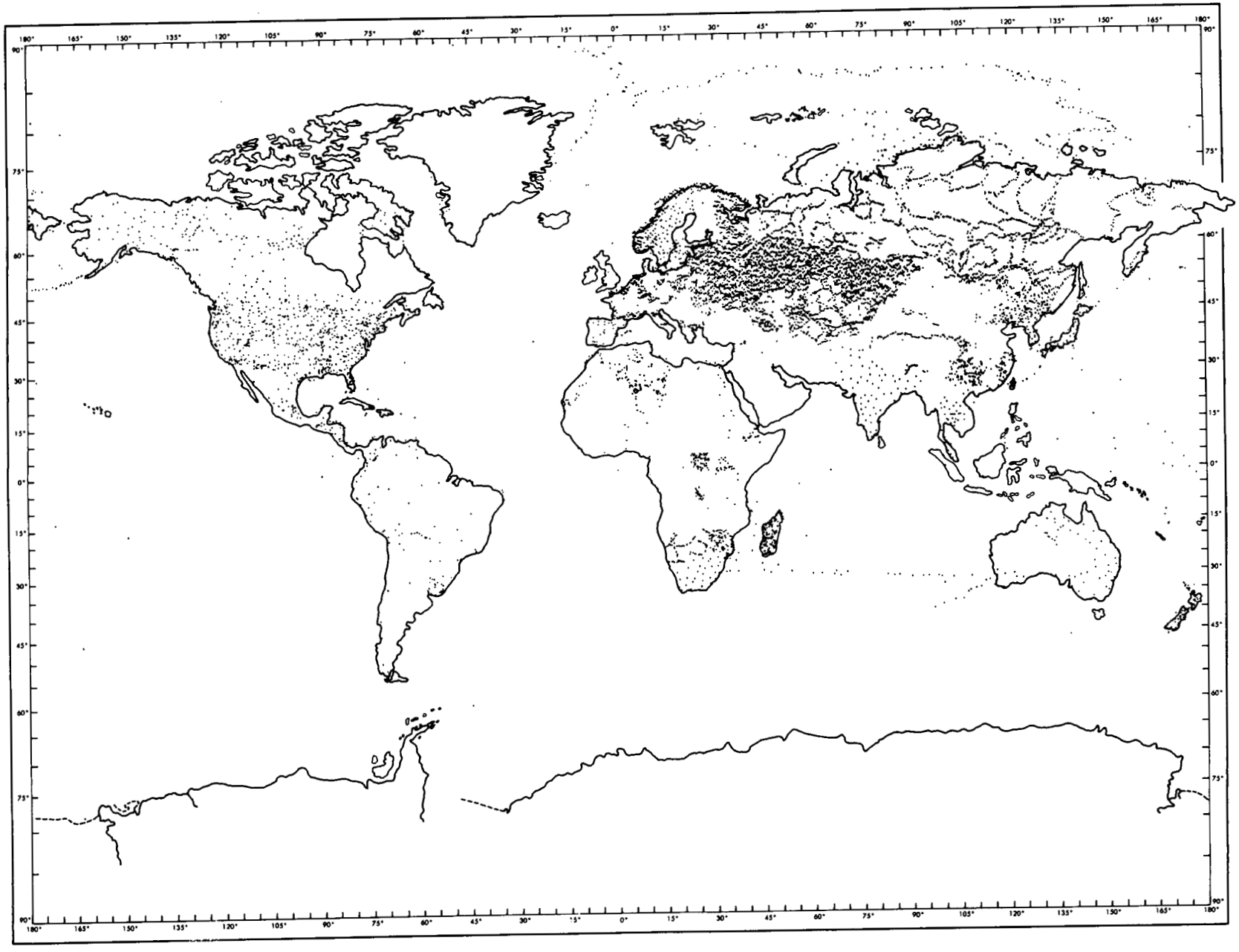


Figure 1(d) Magnetic survey observations from 1935-1945

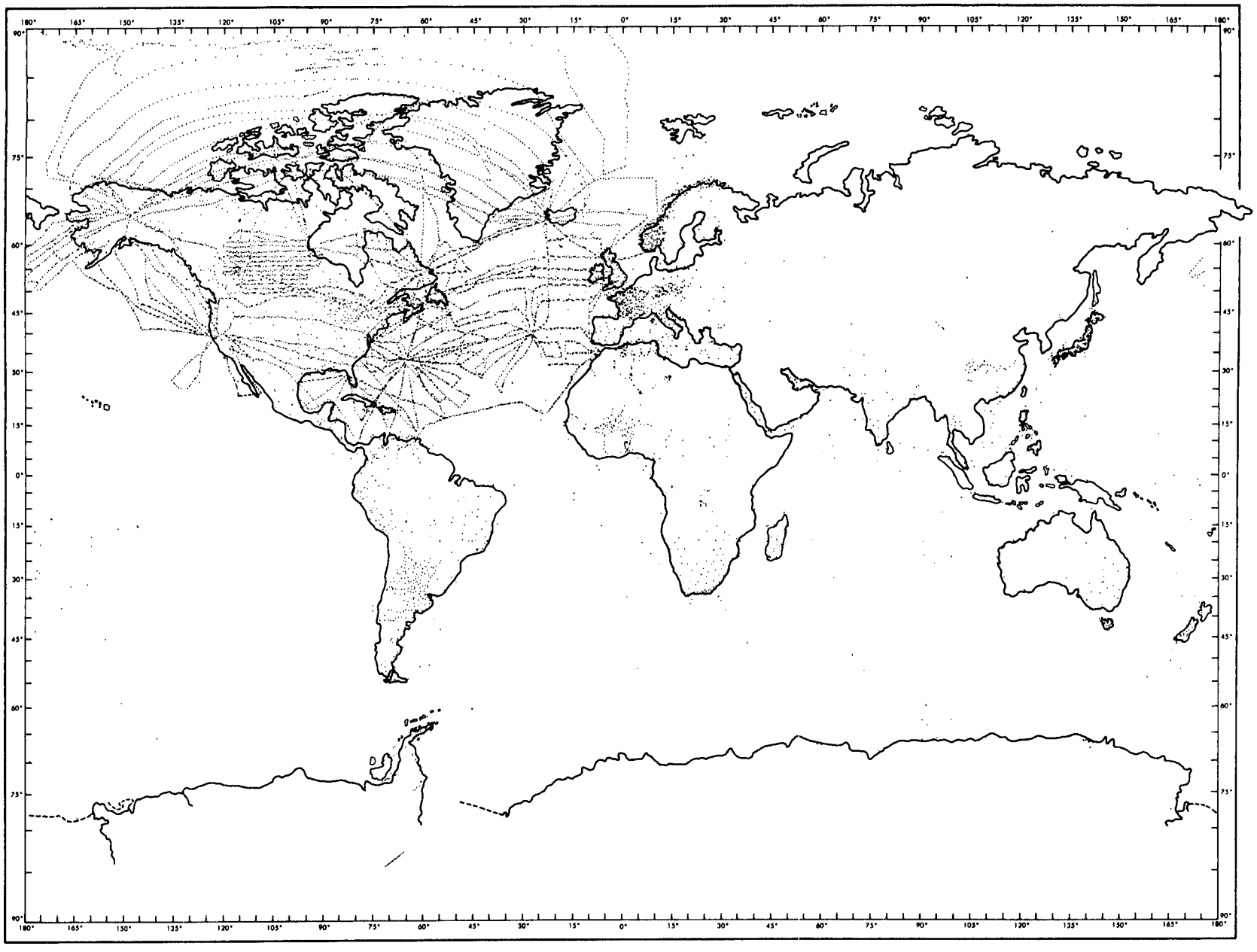


Figure 1(e) Magnetic survey observations from 1945-1955

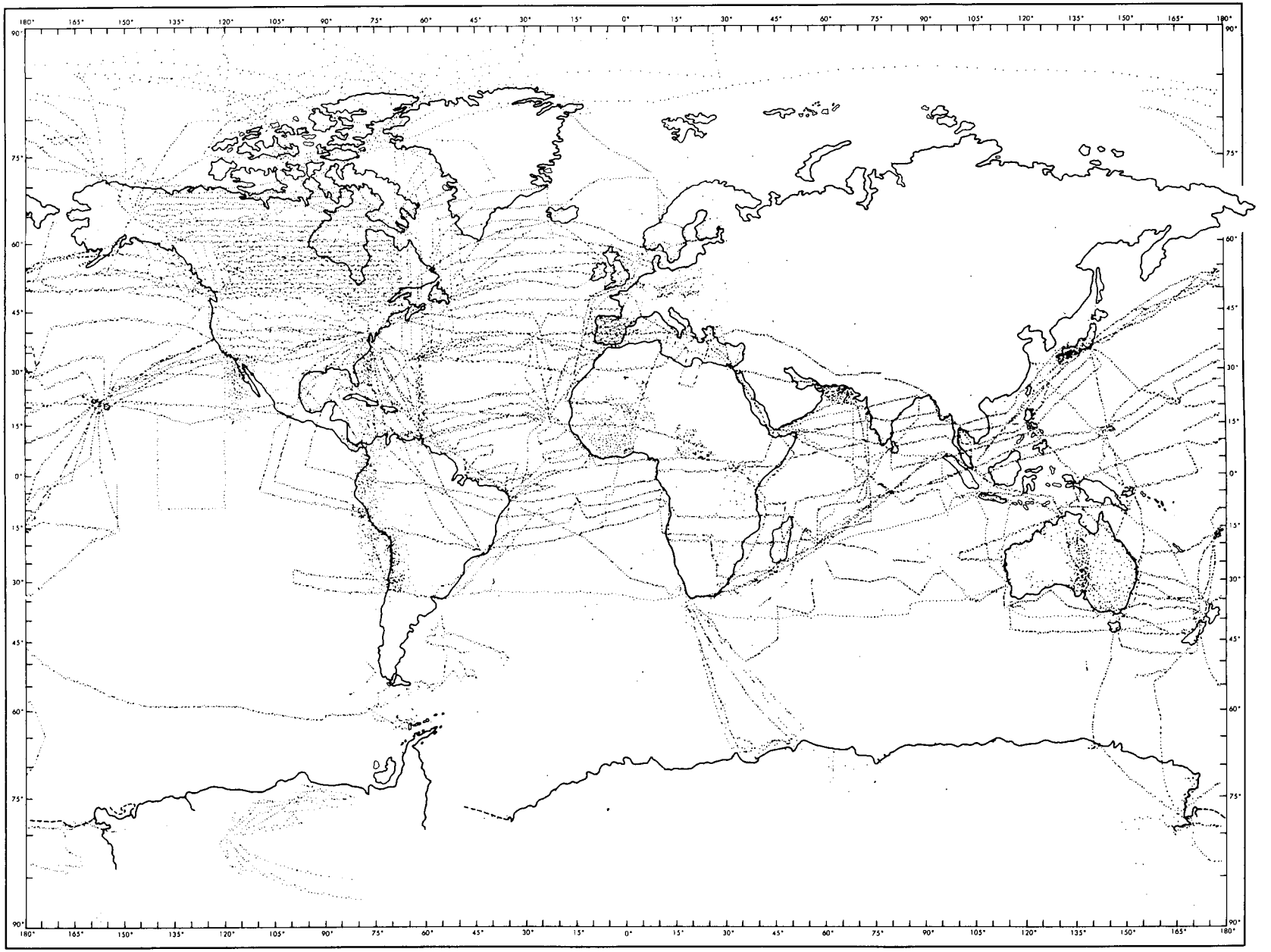


Figure 1(f) Magnetic survey observations from 1955-1962

Figure 2 Location of magnetic observatories

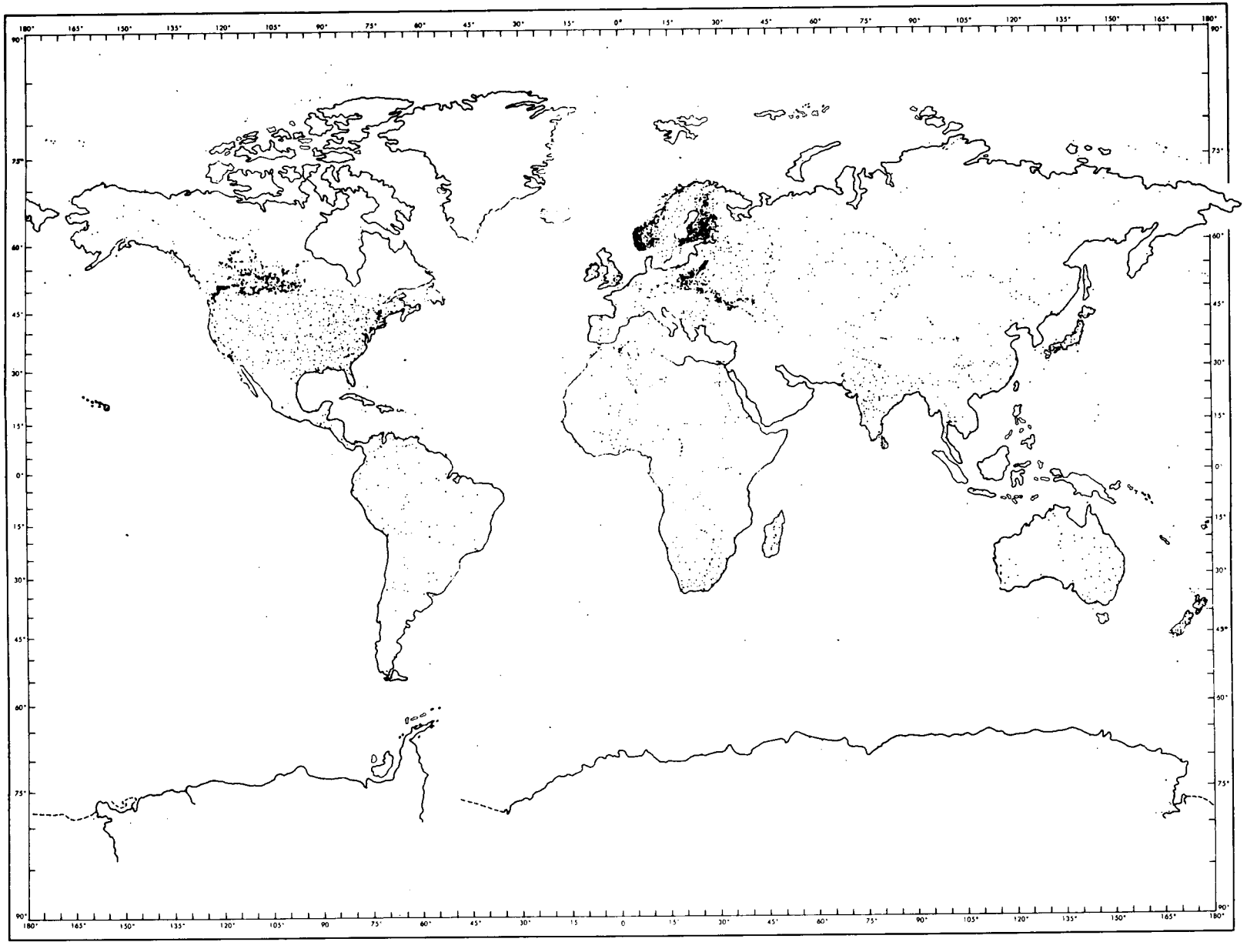

Figure 3(a) "Repeat" stations: exact reoccupations with a time range greater than one year, (4374 points).

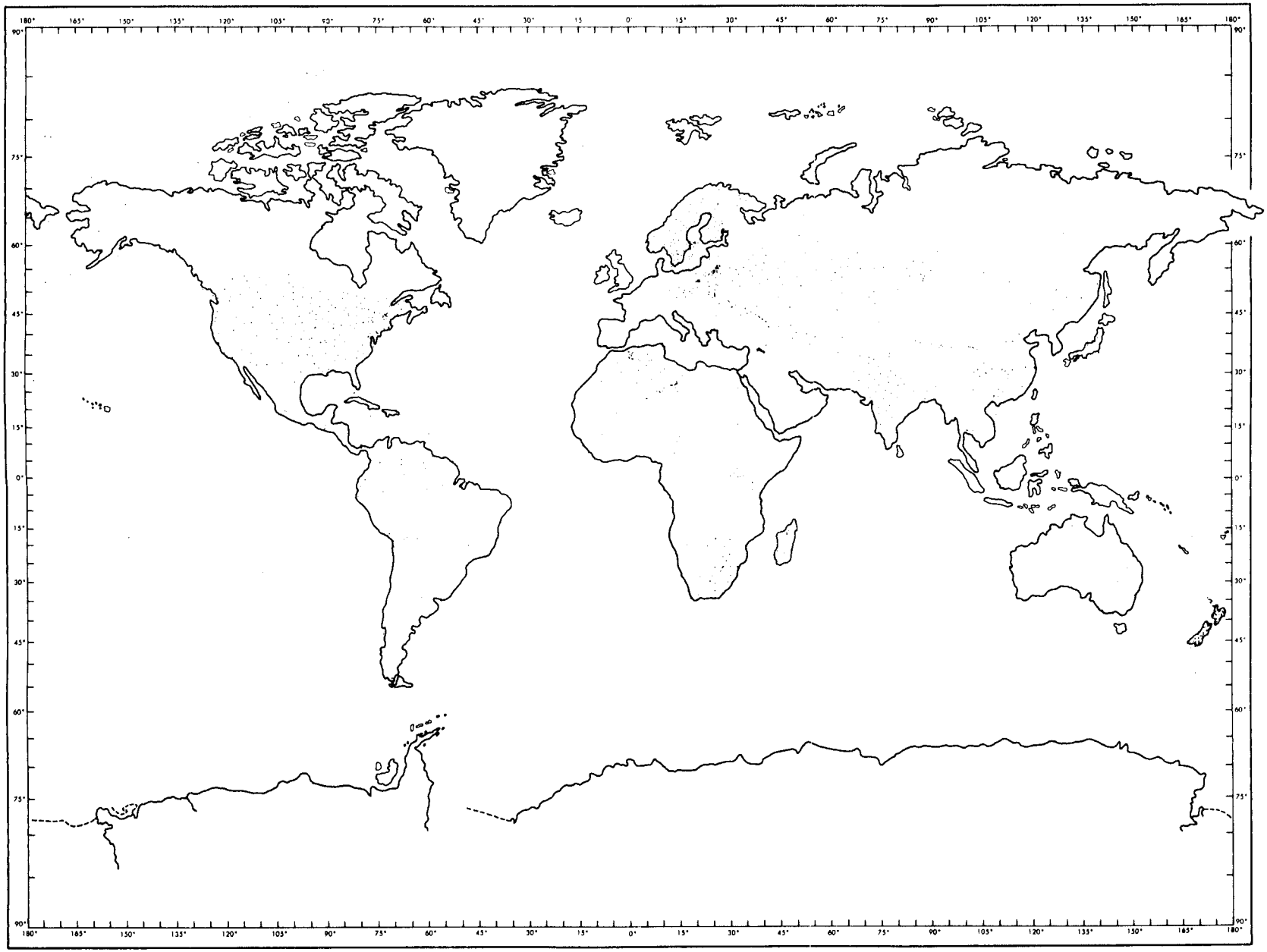

Figure 3(b) "Repeat" stations: exact reoccupations with more than three points, the latest of which is taken after 1930, (1183 points).

DECLINATION

NC. OF CBSERVATICNS= 161190.

| | -90 | -80 | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -170 | 3 | 41 | 56 | 18 | 20 | 34 | 30 | 160 | 137 | 46 | 33 | 63 | 42 | 13 | 323 | 92 | 44 | 4 | |
| -160 | 24 | 143 | 6 | 12 | 4 | 6 | 51 | 87 | 55 | 111 | 122 | 117 | 35 | 33 | 452 | 208 | 87 | 49 | |
| -150 | 7 | 32 | 1 | 8 | 6 | 4 | 30 | 123 | 98 | 91 | 170 | 673 | 51 | 43 | 386 | 215 | 149 | 74 | |
| -140 | 1 | 5 | 3 | 1 | 9 | 19 | 15 | 94 | 12 | 29 | 31 | 322 | 86 | 125 | 171 | 539 | 138 | 28 | |
| -130 | 0 | 2 | 3 | 0 | 11 | 28 | 26 | 14 | 12 | 10 | 56 | 170 | 258 | 194 | 1199 | 384 | 106 | 28 | |
| -120 | 0 | 0 | 2 | 8 | 5 | 15 | 14 | 26 | 6 | 15 | 62 | 64 | 688 | 1574 | 1173 | 410 | 181 | 31 | |
| -110 | 0 | 8 | 0 | 4 | 3 | 25 | 19 | 30 | 14 | 22 | 79 | 102 | 1113 | 1297 | 6882 | 632 | 96 | 154 | |
| -100 | 0 | 10 | 0 | 10 | 5 | 34 | 25 | 16 | 74 | 58 | 97 | 142 | 815 | 1315 | 5405 | 310 | 155 | 135 | |
| -90 | 0 | 12 | 0 | 15 | 9 | 32 | 43 | 19 | 87 | 67 | 272 | 494 | 1526 | 1513 | 2397 | 356 | 156 | 378 | |
| -80 | 0 | 14 | 0 | 19 | 6 | 45 | 49 | 65 | 132 | 169 | 268 | 726 | 2150 | 1608 | 527 | 225 | 163 | 172 | |
| -70 | 0 | 6 | 2 | 63 | 33 | 174 | 93 | 464 | 220 | 441 | 478 | 500 | 1454 | 2301 | 549 | 313 | 161 | 61 | |
| -60 | 0 | 26 | 73 | 77 | 89 | 282 | 133 | 159 | 143 | 235 | 774 | 439 | 1006 | 1255 | 594 | 267 | 187 | 43 | |
| -50 | 0 | 1 | 59 | 56 | 13 | 318 | 125 | 125 | 151 | 281 | 250 | 363 | 668 | 721 | 538 | 257 | 95 | 16 | |
| -40 | 0 | 48 | 50 | 3 | 11 | 34 | 296 | 118 | 292 | 145 | 148 | 180 | 421 | 215 | 360 | 191 | 74 | 16 | |
| -30 | 0 | 17 | 6 | 17 | 4 | 24 | 46 | 148 | 450 | 67 | 160 | 162 | 430 | 218 | 184 | 318 | 67 | 16 | |
| -20 | 0 | 7 | 0 | 3 | 6 | 13 | 50 | 120 | 201 | 145 | 272 | 188 | 569 | 375 | 226 | 415 | 87 | 21 | |
| -10 | 0 | 0 | 0 | 3 | 6 | 30 | 16 | 121 | 92 | 304 | 232 | 230 | 481 | 180 | 357 | 200 | 83 | 29 | |
| 0 | 0 | 0 | 0 | 4 | 11 | 32 | 11 | 118 | 94 | 263 | 407 | 202 | 1224 | 1599 | 863 | 145 | 74 | 41 | |
| 10 | 0 | 0 | 0 | 9 | 3 | 41 | 30 | 42 | 109 | 170 | 300 | 772 | 729 | 2488 | 2554 | 706 | 52 | 51 | |
| 20 | 0 | 0 | 0 | 4 | 0 | 304 | 210 | 194 | 224 | 302 | 156 | 257 | 265 | 2605 | 3687 | 2563 | 102 | 5 | |
| 30 | 0 | 0 | 0 | 3 | 1 | 825 | 638 | 279 | 149 | 210 | 54 | 30 | 212 | 1762 | 3712 | 3313 | 416 | 10 | |
| 40 | 0 | 0 | 20 | 5 | 14 | 31 | 380 | 188 | 393 | 268 | 107 | 360 | 405 | 2723 | 3016 | 1364 | 23 | 5 | |
| 50 | 0 | 0 | 2 | 3 | 13 | 13 | 337 | 788 | 80 | 143 | 203 | 28 | 232 | 1373 | 2105 | 433 | 13 | 2 | |
| 60 | 0 | 0 | 6 | 0 | 12 | 14 | 91 | 118 | 56 | 92 | 166 | 109 | 183 | 535 | 1904 | 320 | 73 | 69 | |
| 70 | 0 | 18 | 31 | 2 | 46 | 15 | 34 | 43 | 107 | 101 | 151 | 454 | 242 | 626 | 1590 | 233 | 24 | 14 | |
| 80 | 0 | 2 | 10 | 20 | 21 | 38 | 17 | 50 | 176 | 341 | 596 | 420 | 631 | 874 | 1221 | 197 | 45 | 8 | |
| 90 | 0 | 0 | 18 | 5 | 16 | 24 | 10 | 17 | 69 | 150 | 152 | 374 | 48 | 642 | 1967 | 170 | 130 | 7 | |
| 100 | 0 | 1 | 31 | 1 | 9 | 44 | 10 | 25 | 89 | 109 | 205 | 233 | 108 | 96 | 408 | 88 | 110 | 4 | |
| 110 | 0 | 0 | 2 | 9 | 14 | 34 | 68 | 29 | 199 | 214 | 335 | 349 | 362 | 71 | 546 | 126 | 285 | 2 | |
| 120 | 0 | 0 | 7 | 12 | 22 | 315 | 106 | 40 | 131 | 113 | 100 | 532 | 266 | 154 | 431 | 114 | 60 | 3 | |
| 130 | 0 | 0 | 0 | 4 | 46 | 60 | 47 | 86 | 85 | 134 | 288 | 332 | 563 | 384 | 467 | 232 | 75 | 11 | |
| 140 | 0 | 0 | 4 | 19 | 32 | 192 | 144 | 190 | 154 | 112 | 45 | 76 | 1000 | 400 | 173 | 247 | 45 | 16 | |
| 150 | 0 | 13 | 132 | 40 | 111 | 335 | 172 | 156 | 84 | 104 | 275 | 111 | 328 | 616 | 148 | 33 | 60 | 9 | |
| 160 | 8 | 40 | 10 | 37 | 52 | 192 | 225 | 79 | 102 | 63 | 95 | 45 | 10 | 146 | 186 | 143 | 153 | 0 | |
| 170 | 25 | 327 | 57 | 65 | 263 | 132 | 84 | 33 | 61 | 81 | 78 | 75 | 13 | 147 | 125 | 152 | 297 | 0 | |
| 180 | 17 | 121 | 8 | 41 | 815 | 592 | 168 | 172 | 54 | 58 | 60 | 49 | 39 | 22 | 241 | 85 | 128 | 1 | |

OBSERVATIONS PER $10^{\circ}$ BLOCK OF LATITUDE - LONGITUDE

TABLE 1 (a)

INCLINATION

NC. OF CBSERVATICNS= 99965.

| | -90 | -80 | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -170 | 0 | 12 | 27 | 14 | 11 | 34 | 26 | 135 | 165 | 37 | 60 | 93 | 68 | 18 | 207 | 98 | 44 | 3 | |
| -160 | 3 | 102 | 0 | 3 | 4 | 4 | 44 | 27 | 55 | 147 | 157 | 113 | 46 | 56 | 180 | 140 | 72 | 29 | |
| -150 | 6 | 14 | 1 | 2 | 4 | 6 | 19 | 58 | 39 | 48 | 151 | 543 | 46 | 61 | 189 | 199 | 88 | 41 | |
| -140 | 1 | 4 | 1 | 0 | 6 | 13 | 7 | 76 | 9 | 13 | 26 | 282 | 80 | 144 | 126 | 265 | 79 | 22 | |
| -130 | 0 | 1 | 2 | 0 | 8 | 19 | 17 | 5 | 8 | 7 | 49 | 167 | 204 | 205 | 260 | 111 | 91 | 21 | |
| -120 | 0 | 0 | 1 | 2 | 3 | 11 | 7 | 12 | 3 | 13 | 67 | 65 | 507 | 575 | 103 | 42 | 80 | 30 | |
| -110 | 0 | 8 | 0 | 2 | 2 | 14 | 9 | 12 | 9 | 15 | 76 | 102 | 703 | 520 | 325 | 45 | 71 | 36 | |
| -100 | 0 | 11 | 0 | 4 | 5 | 22 | 8 | 6 | 72 | 71 | 112 | 134 | 671 | 462 | 376 | 21 | 175 | 29 | |
| -90 | 0 | 18 | 0 | 5 | 8 | 31 | 45 | 7 | 78 | 68 | 273 | 397 | 1192 | 1023 | 142 | 57 | 129 | 20 | |
| -80 | 0 | 15 | 0 | 10 | 4 | 33 | 39 | 71 | 102 | 86 | 231 | 556 | 1825 | 965 | 77 | 3 | 102 | 24 | |
| -70 | 0 | 0 | 1 | 38 | 20 | 134 | 80 | 401 | 167 | 319 | 443 | 509 | 1236 | 1250 | 19 | 67 | 131 | 41 | |
| -60 | 0 | 0 | 19 | 48 | 37 | 156 | 69 | 136 | 142 | 215 | 759 | 459 | 935 | 705 | 67 | 33 | 122 | 27 | |
| -50 | 0 | 0 | 29 | 56 | 6 | 125 | 89 | 143 | 185 | 283 | 308 | 377 | 519 | 546 | 278 | 145 | 86 | 16 | |
| -40 | 0 | 63 | 89 | 5 | 4 | 13 | 270 | 143 | 277 | 163 | 205 | 166 | 472 | 278 | 339 | 122 | 53 | 23 | |
| -30 | 0 | 10 | 1 | 9 | 2 | 4 | 37 | 133 | 464 | 66 | 198 | 177 | 519 | 240 | 210 | 239 | 63 | 18 | |
| -20 | 0 | 1 | 0 | 4 | 5 | 1 | 23 | 97 | 211 | 144 | 320 | 185 | 634 | 395 | 258 | 316 | 63 | 21 | |
| -10 | 0 | 0 | 0 | 2 | 10 | 8 | 7 | 103 | 83 | 286 | 191 | 214 | 514 | 161 | 282 | 123 | 65 | 36 | |
| 0 | 0 | 0 | 0 | 2 | 7 | 10 | 5 | 121 | 78 | 126 | 96 | 68 | 541 | 456 | 730 | 114 | 78 | 33 | |
| 10 | 0 | 0 | 0 | 2 | 3 | 17 | 8 | 42 | 125 | 120 | 131 | 247 | 299 | 333 | 552 | 120 | 55 | 49 | |
| 20 | 0 | 0 | 0 | 2 | 0 | 267 | 120 | 223 | 161 | 200 | 78 | 115 | 212 | 1188 | 854 | 251 | 36 | 4 | |
| 30 | 0 | 0 | 0 | 2 | 0 | 482 | 412 | 260 | 49 | 102 | 32 | 30 | 192 | 1238 | 1565 | 1678 | 61 | 6 | |
| 40 | 0 | 0 | 22 | 3 | 3 | 15 | 249 | 162 | 276 | 191 | 74 | 309 | 262 | 2227 | 2313 | 1072 | 2 | 4 | |
| 50 | 0 | 0 | 1 | 1 | 2 | 5 | 81 | 373 | 90 | 121 | 178 | 38 | 225 | 1220 | 2165 | 420 | 0 | 5 | |
| 60 | 0 | 0 | 0 | 0 | 3 | 3 | 82 | 121 | 48 | 87 | 136 | 93 | 170 | 506 | 1969 | 315 | 46 | 38 | |
| 70 | 0 | 0 | 7 | 0 | 21 | 0 | 9 | 36 | 89 | 81 | 126 | 647 | 227 | 608 | 1602 | 221 | 14 | 9 | |
| 80 | 0 | 0 | 0 | 10 | 6 | 16 | 9 | 37 | 203 | 322 | 597 | 413 | 418 | 843 | 1034 | 186 | 15 | 9 | |
| 90 | 0 | 0 | 2 | 0 | 4 | 3 | 3 | 2 | 119 | 154 | 187 | 403 | 57 | 422 | 1223 | 165 | 104 | 5 | |
| 100 | 0 | 0 | 12 | 0 | 0 | 16 | 4 | 14 | 135 | 107 | 280 | 222 | 108 | 57 | 294 | 83 | 101 | 3 | |
| 110 | 0 | 0 | 0 | 4 | 4 | 4 | 63 | 7 | 180 | 248 | 378 | 178 | 207 | 54 | 534 | 114 | 285 | 2 | |
| 120 | 0 | 0 | 4 | 4 | 22 | 218 | 97 | 31 | 119 | 119 | 130 | 339 | 231 | 68 | 386 | 133 | 46 | 3 | |
| 130 | 0 | 0 | 0 | 0 | 38 | 44 | 45 | 94 | 105 | 84 | 243 | 201 | 451 | 129 | 350 | 206 | 61 | 11 | |
| 140 | 0 | 0 | 4 | 6 | 40 | 179 | 136 | 169 | 97 | 73 | 45 | 103 | 992 | 266 | 152 | 235 | 39 | 14 | |
| 150 | 0 | 9 | 103 | 40 | 129 | 297 | 126 | 87 | 120 | 136 | 298 | 110 | 405 | 578 | 71 | 35 | 56 | 8 | |
| 160 | 1 | 22 | 2 | 40 | 73 | 168 | 179 | 65 | 113 | 71 | 86 | 87 | 8 | 158 | 77 | 137 | 117 | 0 | |
| 170 | 0 | 71 | 30 | 33 | 276 | 105 | 71 | 25 | 59 | 86 | 67 | 127 | 13 | 136 | 58 | 131 | 174 | 0 | |
| 180 | 1 | 49 | 0 | 24 | 666 | 568 | 144 | 164 | 47 | 63 | 57 | 64 | 48 | 24 | 169 | 93 | 90 | 1 | |

OBSERVATIONS PER $10^{o}$ BLOCK OF LATITUDE - LONGITUDE

TABLE 1 (b)

TCTAL FIELD

NC. CF CBSERVATICNS= 55506.

| | -90 | -80 | -7C | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -170 | 0 | 7 | 34 | 37 | 46 | 26 | 15 | 58 | 156 | 34 | 58 | 109 | 65 | 37 | 255 | 40 | 162 | 33 | |
| -160 | 0 | 7 | 0 | 48 | 0 | 0 | 40 | 5 | 48 | 143 | 151 | 100 | 32 | 74 | 153 | 98 | 210 | 55 | |
| -150 | 3 | 0 | 0 | 38 | 0 | 0 | 0 | 48 | 26 | 28 | 113 | 455 | 40 | 61 | 226 | 232 | 176 | 68 | |
| -140 | 0 | 0 | 0 | 31 | 0 | 0 | 0 | 0 | 5 | 7 | 27 | 281 | 66 | 150 | 200 | 284 | 129 | 27 | |
| -130 | 0 | 0 | 0 | 38 | 0 | 0 | 0 | 1 | 14 | 3 | 42 | 154 | 199 | 207 | 223 | 101 | 109 | 29 | |
| -120 | 10 | 0 | 0 | 38 | 0 | 0 | 0 | 0 | 17 | 7 | 71 | 66 | 410 | 302 | 48 | 28 | 97 | 49 | |
| -110 | 68 | 113 | 12 | 34 | 0 | 0 | 0 | 0 | 4 | 4 | 96 | 302 | 776 | 150 | 41 | 33 | 97 | 91 | |
| -100 | 28 | 94 | 32 | 0 | 0 | 0 | 0 | 0 | 74 | 65 | 99 | 37 | 255 | 132 | 32 | 23 | 228 | 54 | |
| -90 | 24 | 122 | 40 | 0 | 0 | 26 | 41 | 0 | 69 | 57 | 121 | 262 | 264 | 144 | 15 | 47 | 157 | 47 | |
| -80 | 14 | 37 | 48 | 10 | 0 | 25 | 30 | 69 | 81 | 21 | 94 | 324 | 470 | 152 | 38 | 0 | 109 | 62 | |
| -70 | 1 | 0 | 73 | 93 | 0 | 214 | 194 | 306 | 158 | 105 | 370 | 541 | 1077 | 258 | 0 | 0 | 190 | 61 | |
| -60 | 0 | 0 | 105 | 71 | 4 | 173 | 92 | 44 | 68 | 113 | 692 | 605 | 794 | 462 | 40 | 31 | 157 | 121 | |
| -50 | 0 | 0 | 0 | 129 | 225 | 59 | 18 | 70 | 133 | 208 | 303 | 382 | 528 | 555 | 193 | 100 | 82 | 50 | |
| -40 | 0 | 0 | 6 | 81 | 79 | 98 | 158 | 62 | 181 | 178 | 208 | 165 | 473 | 294 | 340 | 116 | 53 | 53 | |
| -30 | 0 | 0 | 0 | 11 | 45 | 21 | 87 | 209 | 441 | 57 | 186 | 182 | 515 | 252 | 207 | 235 | 63 | 43 | |
| -20 | 0 | 1 | 0 | 0 | 0 | 8 | 21 | 251 | 217 | 151 | 333 | 189 | 590 | 403 | 240 | 310 | 47 | 52 | |
| -10 | 0 | 0 | 0 | 0 | 0 | 9 | 7 | 226 | 91 | 292 | 144 | 174 | 519 | 154 | 259 | 127 | 56 | 60 | |
| 0 | 0 | 0 | 0 | 0 | 0 | 9 | 100 | 88 | 88 | 90 | 54 | 57 | 251 | 201 | 286 | 74 | 70 | 19 | |
| 10 | 0 | 0 | 0 | 0 | 0 | 69 | 11 | 40 | 118 | 46 | 94 | 70 | 68 | 93 | 231 | 60 | 50 | 32 | |
| 20 | 0 | 0 | 0 | 0 | 4 | 224 | 0 | 157 | 68 | 100 | 21 | 35 | 203 | 64 | 89 | 74 | 9 | 11 | |
| 30 | 0 | 0 | 41 | 206 | 302 | 323 | 62 | 119 | 1 | 92 | 0 | 24 | 212 | 50 | 15 | 24 | 0 | 28 | |
| 40 | 0 | 0 | 197 | 125 | 68 | 269 | 154 | 49 | 35 | 113 | 15 | 155 | 117 | 5 | 14 | 4 | 0 | 5 | |
| 50 | 0 | 0 | 222 | 18 | 83 | 99 | 356 | 124 | 98 | 120 | 213 | 33 | 34 | 6 | 5 | 0 | 0 | 3 | |
| 60 | 0 | 0 | 13 | 0 | 0 | 91 | 351 | 197 | 44 | 93 | 157 | 87 | 41 | 0 | 0 | 0 | 2 | 11 | |
| 70 | 0 | 0 | 7 | 0 | 2 | 49 | 109 | 443 | 104 | 107 | 146 | 591 | 5 | 5 | 5 | 0 | 0 | 3 | |
| 80 | 0 | 0 | 0 | 0 | 7 | 69 | 55 | 197 | 461 | 273 | 229 | 46 | 0 | 0 | 0 | 0 | 0 | 3 | |
| 90 | 0 | 0 | 0 | 0 | 0 | 83 | 67 | 12 | 388 | 229 | 122 | 84 | 0 | 0 | 0 | 0 | 11 | 3 | |
| 100 | 0 | 0 | 4 | 0 | 0 | 53 | 51 | 27 | 142 | 359 | 144 | 19 | 0 | 0 | 0 | 0 | 0 | 1 | |
| 110 | 0 | 0 | 0 | 0 | 0 | 137 | 75 | 12 | 131 | 416 | 166 | 1 | 0 | 0 | 5 | 0 | 8 | 3 | |
| 120 | 0 | 0 | 3 | 0 | 23 | 213 | 52 | 40 | 91 | 169 | 487 | 21 | 0 | 0 | 0 | 0 | 0 | 3 | |
| 130 | 0 | 0 | 0 | 0 | 29 | 68 | 0 | 55 | 70 | 56 | 233 | 336 | 50 | 0 | 0 | 5 | 5 | 3 | |
| 140 | 0 | 0 | 4 | 21 | 34 | 324 | 295 | 99 | 82 | 37 | 49 | 123 | 280 | 5 | 0 | 0 | 0 | 3 | |
| 150 | 0 | 7 | 68 | 35 | 78 | 124 | 9 | 42 | 111 | 155 | 268 | 65 | 177 | 42 | 0 | 0 | 0 | 2 | |
| 160 | 1 | 21 | 0 | 59 | 88 | 105 | 142 | 66 | 100 | 43 | 80 | 88 | 1 | 145 | 0 | 14 | 0 | 17 | |
| 170 | 0 | 63 | 33 | 55 | 106 | 108 | 56 | 4 | 37 | 51 | 45 | 126 | 7 | 119 | 16 | 0 | 8 | 23 | |
| 180 | 1 | 42 | 0 | 24 | 94 | 207 | 135 | 129 | 10 | 52 | 47 | 62 | 45 | 27 | 193 | 0 | 32 | 14 | |

OBSERVATIONS PER $10^{\circ}$ BLOCK OF LATITUDE - LONGITUDE

TABLE 1 (e)

TOTAL POINTS

NO. OF OBSERVATIONS= 450149.

| | -90 | -80 | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -170 | 25 | 82 | 117 | 73 | 88 | 103 | 87 | 551 | 473 | 125 | 153 | 271 | 180 | 76 | 853 | 333 | 273 | 42 | |
| -160 | 113 | 415 | 6 | 66 | 13 | 14 | 143 | 228 | 171 | 410 | 439 | 349 | 127 | 172 | 877 | 514 | 371 | 133 | |
| -150 | 25 | 96 | 3 | 50 | 14 | 15 | 67 | 360 | 255 | 271 | 574 | 2044 | 143 | 170 | 869 | 702 | 444 | 189 | |
| -140 | 3 | 13 | 5 | 32 | 21 | 45 | 29 | 246 | 35 | 62 | 91 | 1001 | 246 | 424 | 589 | 1485 | 357 | 79 | |
| -130 | 0 | 4 | 7 | 38 | 27 | 65 | 60 | 25 | 43 | 27 | 160 | 517 | 777 | 641 | 2161 | 1105 | 337 | 84 | |
| -120 | 10 | 0 | 4 | 50 | 11 | 37 | 28 | 50 | 29 | 48 | 206 | 204 | 1872 | 3023 | 2142 | 870 | 376 | 115 | |
| -110 | 68 | 143 | 12 | 42 | 7 | 53 | 37 | 54 | 36 | 56 | 266 | 541 | 2976 | 2547 | 8981 | 1221 | 284 | 281 | |
| -100 | 28 | 137 | 32 | 18 | 15 | 78 | 43 | 28 | 226 | 203 | 341 | 447 | 2184 | 2472 | 7383 | 864 | 641 | 218 | |
| -90 | 24 | 188 | 40 | 25 | 24 | 99 | 136 | 33 | 248 | 206 | 927 | 1327 | 3967 | 3977 | 3911 | 1087 | 568 | 463 | |
| -80 | 14 | 96 | 48 | 49 | 14 | 113 | 133 | 217 | 352 | 349 | 769 | 1884 | 5876 | 4292 | 1613 | 681 | 527 | 262 | |
| -70 | 1 | 6 | 77 | 250 | 74 | 625 | 413 | 1531 | 728 | 1188 | 1421 | 1624 | 4390 | 6147 | 1659 | 917 | 620 | 169 | |
| -60 | 0 | 26 | 303 | 261 | 173 | 799 | 400 | 448 | 447 | 700 | 2636 | 1513 | 3595 | 3937 | 1857 | 782 | 661 | 230 | |
| -50 | 0 | 1 | 178 | 299 | 250 | 646 | 305 | 417 | 536 | 898 | 902 | 1144 | 2139 | 2532 | 1676 | 815 | 324 | 83 | |
| -40 | 0 | 182 | 260 | 94 | 98 | 185 | 985 | 408 | 897 | 520 | 575 | 541 | 1441 | 839 | 1397 | 606 | 180 | 93 | |
| -30 | 0 | 40 | 9 | 47 | 53 | 71 | 202 | 549 | 1427 | 211 | 560 | 551 | 1502 | 733 | 743 | 977 | 193 | 77 | |
| -20 | 0 | 17 | 0 | 11 | 16 | 43 | 109 | 491 | 636 | 464 | 933 | 586 | 1936 | 1191 | 853 | 1300 | 221 | 94 | |
| -10 | 0 | 0 | 0 | 7 | 26 | 81 | 35 | 481 | 272 | 959 | 733 | 717 | 1568 | 524 | 1208 | 562 | 221 | 128 | |
| 0 | 0 | 0 | 0 | 8 | 33 | 79 | 121 | 392 | 292 | 675 | 820 | 398 | 3521 | 3942 | 2908 | 465 | 233 | 129 | |
| 10 | 0 | 0 | 0 | 13 | 9 | 164 | 65 | 131 | 362 | 480 | 728 | 1461 | 1568 | 3948 | 5828 | 2142 | 162 | 167 | |
| 20 | 0 | 0 | 0 | 8 | 4 | 1134 | 503 | 659 | 597 | 829 | 368 | 541 | 801 | 6419 | 6850 | 4984 | 233 | 29 | |
| 30 | 0 | 0 | 41 | 213 | 303 | 2138 | 1550 | 877 | 252 | 573 | 134 | 90 | 736 | 4925 | 9524 | 7933 | 1055 | 56 | |
| 40 | 0 | 0 | 283 | 136 | 96 | 344 | 996 | 550 | 1039 | 715 | 274 | 1157 | 1106 | 8486 | 9572 | 4337 | 56 | 22 | |
| 50 | 0 | 0 | 229 | 23 | 108 | 132 | 1064 | 2043 | 272 | 401 | 689 | 105 | 765 | 4903 | 8572 | 1549 | 28 | 20 | |
| 60 | 0 | 0 | 29 | 0 | 18 | 131 | 662 | 478 | 157 | 292 | 506 | 301 | 611 | 2048 | 7761 | 1202 | 199 | 187 | |
| 70 | 0 | 22 | 62 | 2 | 107 | 81 | 169 | 550 | 340 | 342 | 470 | 1788 | 801 | 2403 | 6274 | 841 | 63 | 47 | |
| 80 | 0 | 2 | 20 | 46 | 54 | 155 | 90 | 314 | 860 | 1166 | 1926 | 1269 | 1625 | 3345 | 4281 | 720 | 97 | 41 | |
| 90 | 0 | 0 | 24 | 5 | 24 | 137 | 83 | 57 | 583 | 610 | 532 | 1198 | 177 | 1773 | 5490 | 628 | 444 | 28 | |
| 100 | 0 | 3 | 66 | 1 | 9 | 147 | 69 | 93 | 396 | 650 | 804 | 677 | 337 | 223 | 1293 | 335 | 421 | 15 | |
| 110 | 0 | 0 | 3 | 17 | 22 | 199 | 225 | 84 | 814 | 955 | 1114 | 799 | 791 | 195 | 2022 | 468 | 1035 | 11 | |
| 120 | 0 | 0 | 27 | 20 | 68 | 1071 | 351 | 137 | 437 | 428 | 731 | 1358 | 717 | 310 | 1574 | 514 | 202 | 15 | |
| 130 | 0 | 0 | 0 | 4 | 122 | 239 | 137 | 281 | 299 | 378 | 979 | 1083 | 1656 | 680 | 1508 | 856 | 260 | 48 | |
| 140 | 0 | 0 | 17 | 52 | 113 | 874 | 679 | 611 | 444 | 313 | 167 | 331 | 3385 | 1115 | 612 | 944 | 156 | 67 | |
| 150 | 0 | 33 | 429 | 120 | 405 | 1108 | 470 | 462 | 363 | 430 | 931 | 331 | 1264 | 1862 | 300 | 112 | 212 | 35 | |
| 160 | 12 | 91 | 12 | 166 | 235 | 629 | 683 | 256 | 371 | 222 | 270 | 220 | 26 | 520 | 399 | 550 | 427 | 17 | |
| 170 | 30 | 624 | 120 | 163 | 846 | 425 | 266 | 96 | 183 | 253 | 214 | 339 | 41 | 484 | 263 | 500 | 685 | 23 | |
| 180 | 61 | 273 | 8 | 89 | 2312 | 1838 | 546 | 538 | 149 | 188 | 175 | 182 | 135 | 80 | 658 | 331 | 357 | 18 | |

OBSERVATIONS PER $10^{\circ}$ BLOCK OF LATITUDE - LONGITUDE

TABLE 1 (f)

HORIZONTAL

NO. OF OBSERVATIONS= 85583.

| | -90 | -80 | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -170 | 11 | 4 | 0 | 4 | 11 | 9 | 14 | 127 | 15 | 8 | 2 | 6 | 5 | 8 | 39 | 76 | 18 | 1 | |
| -160 | 43 | 100 | 0 | 3 | 5 | 4 | 8 | 65 | 11 | 9 | 9 | 19 | 14 | 9 | 67 | 53 | 1 | 0 | |
| -150 | 6 | 20 | 1 | 2 | 4 | 5 | 18 | 73 | 53 | 63 | 94 | 274 | 6 | 5 | 52 | 49 | 18 | 6 | |
| -140 | 1 | 4 | 1 | 0 | 6 | 13 | 7 | 76 | 9 | 13 | 7 | 64 | 14 | 4 | 48 | 228 | 6 | 2 | |
| -130 | 0 | 1 | 2 | 0 | 8 | 18 | 17 | 5 | 9 | 7 | 13 | 23 | 63 | 24 | 275 | 264 | 15 | 6 | |
| -120 | 0 | 0 | 1 | 2 | 3 | 11 | 7 | 12 | 3 | 13 | 6 | 9 | 217 | 431 | 440 | 198 | 9 | 5 | |
| -110 | 0 | 7 | 0 | 2 | 2 | 14 | 9 | 12 | 9 | 15 | 15 | 28 | 327 | 481 | 990 | 258 | 11 | 0 | |
| -100 | 0 | 11 | 0 | 4 | 5 | 22 | 10 | 6 | 6 | 9 | 25 | 101 | 441 | 459 | 974 | 245 | 41 | 0 | |
| -90 | 0 | 18 | 0 | 5 | 7 | 10 | 7 | 7 | 14 | 14 | 180 | 159 | 976 | 1099 | 747 | 302 | 59 | 18 | |
| -80 | 0 | 15 | 0 | 10 | 4 | 10 | 15 | 12 | 37 | 73 | 174 | 259 | 1429 | 1201 | 516 | 222 | 78 | 4 | |
| -70 | 0 | 0 | 1 | 49 | 21 | 103 | 46 | 321 | 183 | 318 | 130 | 74 | 555 | 1679 | 561 | 300 | 92 | 3 | |
| -60 | 0 | 0 | 46 | 50 | 39 | 137 | 78 | 109 | 94 | 137 | 328 | 10 | 475 | 916 | 589 | 238 | 103 | 19 | |
| -50 | 0 | 0 | 39 | 58 | 6 | 126 | 73 | 79 | 67 | 108 | 34 | 15 | 221 | 382 | 379 | 162 | 32 | 1 | |
| -40 | 0 | 69 | 93 | 5 | 4 | 28 | 200 | 85 | 134 | 22 | 14 | 21 | 46 | 32 | 181 | 94 | 0 | 1 | |
| -30 | 0 | 11 | 2 | 10 | 2 | 13 | 19 | 59 | 65 | 17 | 16 | 21 | 28 | 16 | 73 | 94 | 0 | 0 | |
| -20 | 0 | 4 | 0 | 4 | 5 | 11 | 11 | 15 | 4 | 13 | 8 | 15 | 82 | 13 | 66 | 141 | 23 | 0 | |
| -10 | 0 | 0 | 0 | 2 | 10 | 21 | 5 | 19 | 6 | 55 | 107 | 77 | 37 | 22 | 158 | 59 | 16 | 3 | |
| 0 | 0 | 0 | 0 | 2 | 11 | 19 | 5 | 51 | 18 | 130 | 149 | 46 | 911 | 929 | 592 | 71 | 10 | 36 | |
| 10 | 0 | 0 | 0 | 2 | 3 | 27 | 12 | 7 | 10 | 120 | 128 | 314 | 425 | 546 | 1251 | 641 | 5 | 28 | |
| 20 | 0 | 0 | 0 | 2 | 0 | 285 | 146 | 82 | 126 | 171 | 88 | 118 | 84 | 1362 | 1261 | 1122 | 53 | 5 | |
| 30 | 0 | 0 | 0 | 2 | 0 | 456 | 387 | 181 | 52 | 127 | 40 | 6 | 84 | 1289 | 2491 | 1807 | 333 | 8 | |
| 40 | 0 | 0 | 22 | 3 | 7 | 21 | 178 | 144 | 301 | 126 | 73 | 238 | 255 | 2168 | 2320 | 1093 | 17 | 4 | |
| 50 | 0 | 0 | 2 | 1 | 6 | 10 | 178 | 537 | 2 | 13 | 66 | 6 | 193 | 1280 | 2192 | 446 | 15 | 5 | |
| 60 | 0 | 0 | 5 | 0 | 3 | 13 | 79 | 25 | 9 | 13 | 25 | 12 | 145 | 521 | 1978 | 322 | 50 | 40 | |
| 70 | 0 | 2 | 9 | 0 | 23 | 9 | 13 | 16 | 22 | 29 | 29 | 93 | 193 | 607 | 1608 | 229 | 16 | 13 | |
| 80 | 0 | 0 | 5 | 10 | 12 | 21 | 9 | 18 | 12 | 196 | 404 | 386 | 412 | 849 | 1048 | 199 | 24 | 12 | |
| 90 | 0 | 0 | 2 | 0 | 4 | 15 | 3 | 14 | 7 | 64 | 71 | 326 | 71 | 442 | 1343 | 166 | 116 | 8 | |
| 100 | 0 | 1 | 14 | 0 | 0 | 25 | 4 | 16 | 19 | 62 | 155 | 203 | 121 | 70 | 348 | 83 | 113 | 4 | |
| 110 | 0 | 0 | 1 | 4 | 4 | 14 | 12 | 24 | 189 | 66 | 234 | 249 | 222 | 69 | 481 | 114 | 332 | 2 | |
| 120 | 0 | 0 | 7 | 4 | 1 | 259 | 75 | 15 | 70 | 21 | 14 | 408 | 220 | 67 | 384 | 134 | 51 | 3 | |
| 130 | 0 | 0 | 0 | 0 | 9 | 57 | 45 | 45 | 38 | 67 | 122 | 157 | 446 | 128 | 358 | 222 | 69 | 12 | |
| 140 | 0 | 0 | 3 | 6 | 7 | 170 | 97 | 136 | 67 | 58 | 18 | 19 | 956 | 261 | 155 | 238 | 40 | 20 | |
| 150 | 0 | 3 | 109 | 5 | 79 | 280 | 144 | 121 | 37 | 23 | 80 | 45 | 273 | 550 | 57 | 35 | 57 | 8 | |
| 160 | 1 | 4 | 0 | 18 | 12 | 119 | 94 | 31 | 41 | 37 | 9 | 0 | 7 | 43 | 79 | 137 | 139 | 0 | |
| 170 | 0 | 57 | 0 | 10 | 193 | 42 | 42 | 30 | 26 | 35 | 24 | 11 | 8 | 50 | 40 | 135 | 204 | 0 | |
| 180 | 13 | 7 | 0 | 0 | 682 | 422 | 55 | 58 | 38 | 14 | 11 | 7 | 3 | 7 | 31 | 84 | 103 | 1 | |

**OBSERVATIONS PER 10° BLOCK OF LATITUDE - LONGITUDE**

**Table 1 (c)**

VERTICAL

NO. OF OBSERVATIONS= 47905.

| | -90 | -80 | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -170 | 11 | 18 | 0 | 0 | 0 | 0 | 2 | 71 | 0 | 0 | 0 | 0 | 0 | 0 | 29 | 27 | 5 | 1 | |
| -160 | 43 | 63 | 0 | 0 | 0 | 0 | 0 | 44 | 2 | 0 | 0 | 0 | 0 | 0 | 25 | 15 | 1 | 0 | |
| -150 | 3 | 30 | 0 | 0 | 0 | 0 | 0 | 58 | 39 | 41 | 46 | 99 | 0 | 0 | 16 | 7 | 13 | 0 | |
| -140 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 52 | 0 | 1 | 44 | 169 | 5 | 0 | |
| -130 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 3 | 53 | 11 | 204 | 245 | 16 | 0 | |
| -120 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 50 | 141 | 378 | 192 | 9 | 0 | |
| -110 | 0 | 7 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 7 | 57 | 99 | 743 | 253 | 9 | 0 | |
| -100 | 0 | 11 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 8 | 33 | 2 | 104 | 596 | 265 | 42 | 0 | |
| -90 | 0 | 18 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 81 | 15 | 9 | 198 | 610 | 325 | 67 | 0 | |
| -80 | 0 | 15 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 0 | 2 | 19 | 2 | 366 | 455 | 231 | 75 | 0 | |
| -70 | 0 | 0 | 0 | 7 | 0 | 0 | 0 | 39 | 0 | 5 | 0 | 0 | 68 | 659 | 530 | 237 | 46 | 3 | |
| -60 | 0 | 0 | 60 | 15 | 4 | 51 | 28 | 0 | 0 | 0 | 83 | 0 | 385 | 599 | 567 | 213 | 92 | 20 | |
| -50 | 0 | 0 | 51 | 0 | 0 | 18 | 0 | 0 | 0 | 18 | 7 | 7 | 203 | 328 | 288 | 151 | 29 | 0 | |
| -40 | 0 | 2 | 22 | 0 | 0 | 12 | 61 | 0 | 13 | 12 | 0 | 9 | 29 | 20 | 177 | 83 | 0 | 0 | |
| -30 | 0 | 2 | 0 | 0 | 0 | 9 | 13 | 0 | 7 | 4 | 0 | 9 | 10 | 7 | 69 | 91 | 0 | 0 | |
| -20 | 0 | 4 | 0 | 0 | 0 | 10 | 4 | 8 | 3 | 11 | 0 | 9 | 61 | 5 | 63 | 118 | 1 | 0 | |
| -10 | 0 | 0 | 0 | 0 | 0 | 13 | 0 | 12 | 0 | 22 | 59 | 22 | 17 | 7 | 152 | 53 | 1 | 0 | |
| 0 | 0 | 0 | 0 | 0 | 4 | 9 | 0 | 14 | 14 | 66 | 114 | 25 | 594 | 757 | 437 | 61 | 1 | 0 | |
| 10 | 0 | 0 | 0 | 0 | 0 | 10 | 4 | 0 | 0 | 24 | 75 | 58 | 47 | 488 | 1240 | 615 | 0 | 7 | |
| 20 | 0 | 0 | 0 | 0 | 0 | 54 | 27 | 3 | 18 | 56 | 25 | 16 | 37 | 1200 | 959 | 974 | 33 | 4 | |
| 30 | 0 | 0 | 0 | 0 | 0 | 52 | 51 | 38 | 1 | 42 | 8 | 0 | 36 | 586 | 1741 | 1111 | 245 | 4 | |
| 40 | 0 | 0 | 22 | 0 | 4 | 8 | 35 | 7 | 34 | 17 | 5 | 95 | 67 | 1363 | 1909 | 804 | 14 | 4 | |
| 50 | 0 | 0 | 2 | 0 | 4 | 5 | 112 | 221 | 2 | 4 | 29 | 0 | 81 | 1024 | 2105 | 250 | 0 | 5 | |
| 60 | 0 | 0 | 5 | 0 | 0 | 10 | 59 | 17 | 0 | 7 | 22 | 0 | 72 | 486 | 1910 | 245 | 28 | 29 | |
| 70 | 0 | 2 | 8 | 0 | 15 | 8 | 4 | 12 | 18 | 24 | 18 | 3 | 134 | 557 | 1469 | 158 | 9 | 8 | |
| 80 | 0 | 0 | 5 | 6 | 8 | 11 | 0 | 12 | 8 | 34 | 100 | 4 | 164 | 779 | 978 | 138 | 13 | 9 | |
| 90 | 0 | 0 | 2 | 0 | 0 | 12 | 0 | 12 | 0 | 13 | 0 | 11 | 1 | 267 | 957 | 127 | 83 | 5 | |
| 100 | 0 | 1 | 5 | 0 | 0 | 9 | 0 | 11 | 11 | 13 | 20 | 0 | 0 | 0 | 243 | 81 | 97 | 3 | |
| 110 | 0 | 0 | 0 | 0 | 0 | 10 | 7 | 12 | 115 | 11 | 1 | 22 | 0 | 1 | 456 | 114 | 125 | 2 | |
| 120 | 0 | 0 | 6 | 0 | 0 | 66 | 21 | 11 | 26 | 6 | 0 | 58 | 0 | 21 | 373 | 133 | 45 | 3 | |
| 130 | 0 | 0 | 0 | 0 | 0 | 10 | 0 | 1 | 1 | 37 | 93 | 57 | 146 | 39 | 333 | 191 | 50 | 11 | |
| 140 | 0 | 0 | 2 | 0 | 0 | 9 | 7 | 17 | 44 | 33 | 10 | 10 | 157 | 183 | 132 | 224 | 32 | 14 | |
| 150 | 0 | 1 | 17 | 0 | 8 | 72 | 19 | 56 | 11 | 12 | 10 | 0 | 81 | 76 | 24 | 9 | 39 | 8 | |
| 160 | 1 | 4 | 0 | 12 | 10 | 45 | 43 | 15 | 15 | 8 | 0 | 0 | 0 | 28 | 57 | 119 | 18 | 0 | |
| 170 | 5 | 106 | 0 | 0 | 8 | 38 | 13 | 4 | 0 | 0 | 0 | 0 | 0 | 32 | 24 | 82 | 2 | 0 | |
| 180 | 29 | 54 | 0 | 0 | 55 | 49 | 44 | 15 | 0 | 1 | 0 | 0 | 0 | 0 | 24 | 69 | 4 | 1 | |

OBSERVATIONS PER 10$^{\circ}$BLOCK OF LONGITUDE - LONGITUDE

TABLE 1 (d)

DISTRIBUTION BY YEAR

| YEAR | D | I | H | Z | F | Sum |
|---|---|---|---|---|---|---|
| 1900 | 1045 | 821 | 768 | 36 | 0 | 2670 |
| 1901 | 836 | 514 | 485 | 43 | 10 | 1888 |
| 1902 | 892 | 619 | 544 | 52 | 4 | 2111 |
| 1903 | 2165 | 1593 | 1472 | 53 | 4 | 5287 |
| 1904 | 1210 | 772 | 762 | 48 | 4 | 2796 |
| 1905 | 1249 | 1081 | 1068 | 49 | 4 | 3451 |
| 1906 | 1111 | 1032 | 1031 | 49 | 4 | 3227 |
| 1907 | 1043 | 972 | 951 | 150 | 4 | 3120 |
| 1908 | 1153 | 857 | 914 | 51 | 4 | 2979 |
| 1909 | 2420 | 1298 | 1361 | 51 | 3 | 5133 |
| 1910 | 3009 | 1779 | 1841 | 53 | 4 | 6686 |
| 1911 | 2316 | 1003 | 990 | 62 | 4 | 4375 |
| 1912 | 3091 | 1485 | 1579 | 62 | 4 | 6221 |
| 1913 | 3511 | 1516 | 1586 | 47 | 4 | 6664 |
| 1914 | 3329 | 1412 | 1523 | 46 | 4 | 6314 |
| 1915 | 4310 | 1668 | 1845 | 222 | 4 | 8049 |
| 1916 | 3487 | 1280 | 1284 | 47 | 5 | 6103 |
| 1917 | 2462 | 967 | 999 | 64 | 5 | 4497 |
| 1918 | 2114 | 703 | 734 | 139 | 5 | 3695 |
| 1919 | 1747 | 663 | 690 | 63 | 6 | 3169 |
| 1920 | 1936 | 699 | 852 | 58 | 6 | 3551 |
| 1921 | 1707 | 714 | 773 | 49 | 6 | 3249 |
| 1922 | 1688 | 970 | 1000 | 136 | 6 | 3800 |
| 1923 | 1192 | 902 | 958 | 59 | 6 | 3117 |
| 1924 | 1776 | 1116 | 1104 | 54 | 7 | 4057 |
| 1925 | 1241 | 611 | 806 | 286 | 7 | 2951 |
| 1926 | 1311 | 730 | 837 | 114 | 8 | 3000 |
| 1927 | 1058 | 683 | 700 | 56 | 8 | 2505 |
| 1928 | 1418 | 768 | 794 | 57 | 8 | 3045 |
| 1929 | 1291 | 692 | 655 | 72 | 9 | 2719 |
| 1930 | 2407 | 1703 | 1727 | 1204 | 9 | 7050 |
| 1931 | 958 | 288 | 374 | 87 | 8 | 1715 |
| 1932 | 789 | 460 | 472 | 62 | 9 | 1792 |
| 1933 | 990 | 372 | 398 | 87 | 9 | 1856 |
| 1934 | 1371 | 468 | 469 | 69 | 10 | 2387 |
| 1935 | 1248 | 835 | 861 | 652 | 9 | 3605 |
| 1936 | 1227 | 342 | 745 | 406 | 9 | 2729 |
| 1937 | 699 | 246 | 596 | 177 | 10 | 1728 |
| 1938 | 1719 | 269 | 836 | 620 | 9 | 3453 |
| 1939 | 1507 | 368 | 480 | 134 | 10 | 2499 |
| 1940 | 21106 | 20540 | 20894 | 20323 | 9 | 82872 |
| 1941 | 869 | 320 | 375 | 132 | 13 | 1709 |
| 1942 | 1159 | 543 | 936 | 258 | 12 | 2908 |
| 1943 | 1076 | 514 | 702 | 166 | 13 | 2471 |
| 1944 | 9823 | 478 | 509 | 59 | 13 | 10882 |
| 1945 | 934 | 215 | 610 | 468 | 11 | 2238 |
| 1946 | 850 | 397 | 581 | 265 | 11 | 2104 |
| 1947 | 805 | 416 | 625 | 254 | 16 | 2116 |
| 1948 | 1031 | 414 | 698 | 258 | 15 | 2416 |
| 1949 | 676 | 150 | 431 | 299 | 22 | 1578 |
| 1950 | 3246 | 1381 | 1867 | 1616 | 1147 | 9257 |
| 1951 | 4556 | 4450 | 341 | 249 | 4284 | 13880 |
| 1952 | 1345 | 370 | 529 | 372 | 26 | 2642 |
| 1953 | 3490 | 2707 | 1123 | 889 | 2455 | 10664 |
| 1954 | 4327 | 2986 | 1937 | 1691 | 2668 | 13609 |
| 1955 | 3299 | 2303 | 2285 | 1970 | 1300 | 11157 |
| 1956 | 3689 | 3892 | 603 | 450 | 3917 | 12551 |
| 1957 | 3052 | 1692 | 1864 | 1613 | 1771 | 9992 |
| 1958 | 4143 | 1537 | 3338 | 3164 | 3277 | 15459 |
| 1959 | 4700 | 4413 | 1557 | 1570 | 10213 | 22453 |
| 1960 | 9228 | 7383 | 3595 | 3720 | 12617 | 36543 |
| 1961 | 7675 | 7519 | 2245 | 2270 | 10634 | 30343 |
| 1962 | 78 | 74 | 74 | 23 | 813 | 1062 |

TABLE 2

TOTAL POINTS

| | -90 | -80 | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -170 | 23 | 16 | 15 | 7 | 5 | 7 | 3 | 19 | 33 | 6 | 12 | 21 | 16 | 4 | 50 | 3 | 41 | 28 | |
| -160 | 97 | 33 | 0 | 6 | 0 | 0 | 10 | 12 | 11 | 31 | 34 | 22 | 7 | 16 | 36 | 7 | 46 | 31 | |
| -150 | 13 | 14 | 0 | 5 | 0 | 0 | 0 | 25 | 15 | 16 | 35 | 108 | 11 | 13 | 41 | 22 | 52 | 47 | |
| -140 | 0 | 0 | 0 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 5 | 85 | 19 | 11 | 44 | 107 | 45 | 18 | |
| -130 | 0 | 1 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 9 | 31 | 67 | 24 | 91 | 109 | 45 | 34 | |
| -120 | 9 | 0 | 0 | 5 | 0 | 0 | 0 | 0 | 1 | 0 | 15 | 10 | 81 | 74 | 135 | 99 | 48 | 61 | |
| -110 | 63 | 44 | 2 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | 18 | 25 | 97 | 55 | 263 | 132 | 20 | 195 | |
| -100 | 26 | 42 | 6 | 0 | 0 | 0 | 0 | 0 | 16 | 14 | 22 | 6 | 48 | 62 | 236 | 134 | 104 | 145 | |
| -90 | 22 | 58 | 7 | 0 | 0 | 6 | 10 | 0 | 15 | 12 | 23 | 49 | 60 | 93 | 241 | 150 | 77 | 173 | |
| -80 | 13 | 30 | 9 | 1 | 0 | 7 | 6 | 14 | 19 | 6 | 17 | 53 | 108 | 145 | 176 | 112 | 55 | 73 | |
| -70 | 0 | 0 | 13 | 13 | 0 | 32 | 25 | 47 | 17 | 26 | 67 | 81 | 122 | 182 | 181 | 103 | 68 | 68 | |
| -60 | 0 | 0 | 27 | 10 | 2 | 23 | 10 | 10 | 13 | 26 | 114 | 81 | 80 | 174 | 148 | 105 | 117 | 108 | |
| -50 | 0 | 0 | 1 | 18 | 25 | 17 | 4 | 13 | 27 | 49 | 59 | 6 | 86 | 117 | 134 | 89 | 49 | 32 | |
| -40 | 0 | 1 | 0 | 11 | 9 | 13 | 29 | 13 | 42 | 39 | 40 | 12 | 50 | 32 | 114 | 62 | 8 | 39 | |
| -30 | 0 | 2 | 0 | 1 | 5 | 4 | 16 | 27 | 100 | 13 | 41 | 18 | 51 | 14 | 59 | 99 | 1 | 32 | |
| -20 | 0 | 4 | 0 | 0 | 0 | 3 | 5 | 38 | 50 | 35 | 75 | 50 | 78 | 21 | 40 | 95 | 0 | 48 | |
| -10 | 0 | 0 | 0 | 0 | 0 | 4 | 0 | 37 | 19 | 68 | 45 | 46 | 86 | 37 | 58 | 40 | 6 | 38 | |
| 0 | 0 | 0 | 0 | 0 | 1 | 3 | 8 | 21 | 22 | 36 | 36 | 21 | 191 | 271 | 82 | 19 | 25 | 9 | |
| 10 | 0 | 0 | 0 | 0 | 0 | 9 | 2 | 8 | 26 | 14 | 37 | 28 | 27 | 86 | 148 | 7 | 25 | 7 | |
| 20 | 0 | 0 | 0 | 0 | 0 | 28 | 0 | 34 | 14 | 35 | 11 | 8 | 57 | 320 | 99 | 40 | 18 | 10 | |
| 30 | 0 | 0 | 7 | 29 | 34 | 34 | 11 | 22 | 0 | 28 | 2 | 6 | 50 | 34 | 13 | 34 | 0 | 26 | |
| 40 | 0 | 0 | 54 | 17 | 8 | 28 | 26 | 9 | 15 | 25 | 3 | 45 | 41 | 4 | 12 | 3 | 0 | 4 | |
| 50 | 0 | 0 | 43 | 2 | 10 | 10 | 39 | 32 | 21 | 27 | 49 | 7 | 8 | 3 | 4 | 0 | 0 | 2 | |
| 60 | 0 | 0 | 5 | 0 | 0 | 11 | 34 | 36 | 10 | 22 | 40 | 21 | 9 | 0 | 0 | 0 | 1 | 23 | |
| 70 | 0 | 6 | 11 | 0 | 0 | 7 | 10 | 45 | 26 | 25 | 36 | 134 | 3 | 3 | 4 | 0 | 0 | 2 | |
| 80 | 0 | 0 | 2 | 0 | 5 | 10 | 4 | 24 | 68 | 63 | 56 | 11 | 0 | 0 | 0 | 0 | 0 | 2 | |
| 90 | 0 | 0 | 0 | 0 | 0 | 11 | 6 | 4 | 45 | 36 | 26 | 19 | 0 | 0 | 0 | 0 | 7 | 2 | |
| 100 | 0 | 0 | 4 | 0 | 0 | 7 | 5 | 6 | 29 | 39 | 27 | 4 | 0 | 0 | 0 | 0 | 0 | 0 | |
| 110 | 0 | 0 | 0 | 0 | 0 | 16 | 19 | 3 | 33 | 63 | 31 | 0 | 0 | 0 | 4 | 0 | 7 | 2 | |
| 120 | 0 | 0 | 4 | 0 | 7 | 34 | 17 | 10 | 23 | 29 | 57 | 5 | 0 | 0 | 0 | 0 | 0 | 2 | |
| 130 | 0 | 0 | 0 | 0 | 9 | 12 | 1 | 16 | 14 | 23 | 65 | 60 | 19 | 0 | 0 | 5 | 6 | 2 | |
| 140 | 0 | 0 | 1 | 2 | 10 | 42 | 39 | 26 | 28 | 15 | 12 | 27 | 169 | 9 | 0 | 0 | 0 | 2 | |
| 150 | 0 | 7 | 23 | 14 | 23 | 54 | 15 | 25 | 23 | 32 | 59 | 16 | 50 | 19 | 0 | 0 | 0 | 1 | |
| 160 | 6 | 23 | 0 | 16 | 26 | 44 | 49 | 17 | 23 | 9 | 19 | 19 | 0 | 52 | 0 | 6 | 0 | 15 | |
| 170 | 4 | 85 | 16 | 14 | 30 | 40 | 15 | 1 | 7 | 9 | 10 | 26 | 1 | 48 | 7 | 0 | 2 | 21 | |
| 180 | 53 | 52 | 0 | 10 | 28 | 68 | 45 | 33 | 2 | 12 | 10 | 14 | 12 | 6 | 48 | 0 | 10 | 13 | |

OBSERVATIONS PER $10^5$ $km^2$ SINCE 1955

TABLE 5 (b)

TOTAL POINTS

NC. OF CBSERVATICNS= 450149.

| | -90 | -80 | -70 | -60 | -50 | -40 | -30 | -20 | -10 | 0 | 10 | 20 | 30 | 40 | 50 | 60 | 70 | 80 | 90 |
|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|---|
| -170 | 23 | 25 | 22 | 10 | 10 | 10 | 7 | 46 | 38 | 10 | 12 | 24 | 17 | 8 | 120 | 63 | 85 | 39 | |
| -160 | 104 | 129 | 1 | 9 | 1 | 1 | 12 | 19 | 13 | 33 | 36 | 31 | 12 | 19 | 123 | 98 | 116 | 123 | |
| -150 | 23 | 30 | 0 | 7 | 1 | 1 | 5 | 30 | 20 | 22 | 48 | 182 | 14 | 19 | 122 | 134 | 138 | 175 | |
| -140 | 2 | 4 | 0 | 4 | 2 | 4 | 2 | 20 | 2 | 5 | 7 | 89 | 24 | 48 | 83 | 284 | 111 | 73 | |
| -130 | 0 | 1 | 1 | 5 | 3 | 6 | 5 | 2 | 3 | 2 | 13 | 46 | 76 | 73 | 305 | 211 | 105 | 78 | |
| -120 | 9 | 0 | 0 | 7 | 1 | 3 | 2 | 4 | 2 | 3 | 17 | 18 | 185 | 346 | 302 | 166 | 117 | 106 | |
| -110 | 63 | 44 | 2 | 5 | 0 | 5 | 3 | 4 | 2 | 4 | 22 | 48 | 294 | 291 | 1267 | 233 | 88 | 261 | |
| -100 | 26 | 42 | 6 | 2 | 1 | 7 | 3 | 2 | 18 | 16 | 28 | 39 | 215 | 283 | 1042 | 165 | 200 | 202 | |
| -90 | 22 | 58 | 7 | 3 | 2 | 9 | 12 | 2 | 20 | 16 | 77 | 118 | 392 | 455 | 552 | 208 | 177 | 430 | |
| -80 | 13 | 30 | 9 | 6 | 1 | 11 | 11 | 18 | 28 | 28 | 64 | 168 | 580 | 491 | 227 | 130 | 164 | 243 | |
| -70 | 0 | 1 | 14 | 35 | 8 | 61 | 36 | 128 | 59 | 96 | 119 | 145 | 433 | 703 | 234 | 175 | 193 | 157 | |
| -60 | 0 | 8 | 58 | 36 | 19 | 78 | 35 | 37 | 36 | 56 | 220 | 135 | 355 | 450 | 262 | 149 | 206 | 213 | |
| -50 | 0 | 0 | 34 | 42 | 28 | 63 | 27 | 34 | 43 | 72 | 75 | 102 | 211 | 289 | 236 | 156 | 101 | 77 | |
| -40 | 0 | 56 | 49 | 13 | 11 | 18 | 88 | 34 | 72 | 42 | 48 | 48 | 142 | 96 | 197 | 116 | 56 | 86 | |
| -30 | 0 | 12 | 1 | 6 | 6 | 7 | 18 | 46 | 115 | 17 | 46 | 49 | 148 | 83 | 104 | 187 | 60 | 71 | |
| -20 | 0 | 5 | 0 | 1 | 1 | 4 | 9 | 41 | 51 | 37 | 78 | 52 | 191 | 136 | 120 | 249 | 69 | 87 | |
| -10 | 0 | 0 | 0 | 0 | 2 | 8 | 3 | 40 | 22 | 77 | 61 | 64 | 155 | 60 | 170 | 107 | 69 | 118 | |
| 0 | 0 | 0 | 0 | 1 | 3 | 7 | 10 | 32 | 23 | 54 | 68 | 35 | 348 | 451 | 410 | 89 | 72 | 119 | |
| 10 | 0 | 0 | 0 | 1 | 1 | 16 | 5 | 10 | 29 | 39 | 61 | 130 | 155 | 452 | 822 | 410 | 50 | 155 | |
| 20 | 0 | 0 | 0 | 1 | 0 | 112 | 44 | 55 | 48 | 67 | 30 | 48 | 79 | 735 | 967 | 954 | 72 | 26 | |
| 30 | 0 | 0 | 7 | 30 | 34 | 211 | 138 | 73 | 20 | 46 | 11 | 8 | 72 | 563 | 1344 | 1520 | 330 | 52 | |
| 40 | 0 | 0 | 54 | 19 | 10 | 34 | 88 | 46 | 84 | 58 | 22 | 103 | 109 | 971 | 1351 | 830 | 17 | 20 | |
| 50 | 0 | 0 | 43 | 3 | 12 | 13 | 95 | 171 | 22 | 32 | 57 | 9 | 75 | 561 | 1210 | 296 | 8 | 18 | |
| 60 | 0 | 0 | 5 | 0 | 2 | 12 | 59 | 40 | 12 | 23 | 42 | 26 | 60 | 234 | 1095 | 230 | 62 | 173 | |
| 70 | 0 | 6 | 11 | 0 | 12 | 8 | 15 | 46 | 27 | 27 | 39 | 159 | 79 | 275 | 885 | 161 | 19 | 43 | |
| 80 | 0 | 0 | 3 | 6 | 6 | 15 | 8 | 26 | 69 | 94 | 161 | 113 | 160 | 383 | 604 | 137 | 30 | 38 | |
| 90 | 0 | 0 | 4 | 0 | 2 | 13 | 7 | 4 | 47 | 49 | 44 | 107 | 17 | 203 | 775 | 120 | 138 | 26 | |
| 100 | 0 | 0 | 12 | 0 | 1 | 14 | 6 | 7 | 32 | 52 | 67 | 60 | 33 | 25 | 182 | 64 | 131 | 13 | |
| 110 | 0 | 0 | 0 | 2 | 2 | 19 | 20 | 7 | 66 | 77 | 93 | 71 | 78 | 22 | 285 | 89 | 323 | 10 | |
| 120 | 0 | 0 | 5 | 2 | 7 | 105 | 31 | 11 | 35 | 34 | 61 | 121 | 70 | 35 | 222 | 98 | 63 | 13 | |
| 130 | 0 | 0 | 0 | 0 | 13 | 23 | 12 | 23 | 24 | 30 | 82 | 96 | 163 | 77 | 212 | 164 | 81 | 44 | |
| 140 | 0 | 0 | 3 | 7 | 12 | 86 | 60 | 51 | 36 | 25 | 13 | 29 | 334 | 127 | 86 | 180 | 48 | 62 | |
| 150 | 0 | 10 | 82 | 16 | 46 | 109 | 41 | 38 | 29 | 34 | 78 | 29 | 124 | 213 | 42 | 21 | 66 | 32 | |
| 160 | 11 | 28 | 2 | 23 | 26 | 62 | 61 | 21 | 30 | 18 | 22 | 19 | 2 | 59 | 56 | 105 | 133 | 15 | |
| 170 | 27 | 195 | 22 | 23 | 96 | 42 | 23 | 8 | 14 | 20 | 17 | 30 | 4 | 55 | 37 | 95 | 214 | 21 | |
| 180 | 56 | 85 | 1 | 12 | 264 | 181 | 48 | 45 | 12 | 15 | 14 | 16 | 13 | 9 | 92 | 63 | 111 | 16 | |

OBSERVATIONS PER $10^5$ $km^2$ SINCE 1900

TABLE 5 (a)