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Magnetic Observations at Macquarie Island, 1952

By

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A B S T R A C T

This report describes the Macquarie Island Magnetic Observatory, the staffing and operation of which is the responsibility of the Bureau of Mineral Resources, Geology and Geophysics, Department of National Development, Commonwealth of Australia.

Details are given of the observatory site and buildings, and of the instruments used at the observatory, which came into full-scale continuous operation in April 1952. The greater part of the report consists of the presentation in tabular form of the magnetic observations made at Macquarie Island during the period April to December, 1952.

INTRODUCTION

During the summer of 1947-48 the Australian National Antarctic Research Expedition of the Antarctic Division of the Department of External Affairs established a scientific research station on Macquarie Island. This base has been continuously manned since then, and the research activities include a programme in geomagnetism, which is conducted by the Geophysical Section of the Bureau of Mineral Resources, Geology and Geophysics. The magnetic observatory started continuous operation in March 1952.

Macquarie Island is a sub-antarctic island situated about 900 miles south-south-east of Tasmania. It was discovered in 1810 by Captain Fred Hasselborough in the sealing brig "Perseverance". Despite visits by members of antarctic expeditions under Bellingshausen in 1821, Wilkes in 1840, Scott in 1901 and J.K. Davis of Shackleton's party in 1909, the first magnetic measurements were not made until 1911 (Webb, 1925). In that year (1911), a base was established on the island by the Australian Antarctic Expedition under Mawson. This station was closed down in 1915 and the next magnetic observations were made by A.E. Kennedy of the British-Australian-New Zealand Antarctic Expedition which visited the island in 1930 (Farr, 1944). During the establishment of the present station in March 1948, magnetic observations were made by N.G. Chamberlain of the Bureau of Mineral Resources (Chamberlain, 1952). Continuous occupation by geophysicists engaged in magnetic observations has been maintained since April 1950.

OBSERVATORY SITE AND BUILDINGS

To select a suitable site for the magnetic observatory, a vertical-intensity variometer survey was made in April 1949, by A.E. Bunbury (Jacka, 1953). Taking into account the need for accessibility and for convenience in erecting buildings, a site was selected where natural magnetic disturbances are a minimum. The selected site is about 1,200 feet south-south-west of the main station area, and its co-ordinates are:-

Geographic	- latitude	54° 30'S.
	longitude	158° 57'E.
Geomagnetic	- latitude	-61°
	longitude	243°

The observatory buildings are on a level grassy area, about 25 ft. above sea level and more than 300 ft. from the nearest camp building.

Climatic conditions are severe, but in general do not hamper the operation of the observatory. The average temperature during 1952 was about 39°F, with a minimum of 25°F and a maximum of 52°F. Wind, mainly from the west, has an average velocity of 16 m.p.h. with occasional gusts of over 100 m.p.h. There are few calm days.

The absolute and variometer huts are pre-fabricated buildings consisting of a frame with roof, floor and wall panels made of 2 1/2 inch sheets of "Onazote", faced with bond-wood. The huts are guyed to the ground to prevent any movement during very strong winds. Both buildings were erected by expedition members during relief operations in April 1950.

The variometer hut (Plate 1, Fig.1) measures 12ft. x 18ft. and is divided into three sections, namely, the porch, 6ft. x 6ft., the control room, 6ft. x 6ft., and the variometer room, 12ft. x 12ft. The porch serves as the entrance and light trap. In the control room are the time-marking clock and the panel with the recorder and scale-value control units. The piers for the variometers and recorder are situated in the northern half of the variometer room, the recorder being on the west of the variometers, as indicated on the floor plan. A general view of the variometer hut is shown in the photograph in Plate 2 (Fig.1). The arrangement of the variometers and recorder is shown in Plate 3 (Fig.1).

A small elevated structure, situated about 80 feet east of the variometer hut, houses batteries and a trickle charger to supply the required D.C. power to the magnetograph.

The absolute hut (Plate 1, Fig.2) measures 12ft. x 12ft., and contains seven windows and two skylights. This hut is well lit and provides ample space for making absolute observations. Two piers in the northern half of the hut, one under each skylight, are used for making the absolute observations. The eastern pier, station E, is used for

observing horizontal intensity and declination with the Q.H.Ms., and the western pier, station Ew, for observing vertical intensity with the B.M.Z. A general view of the absolute hut is shown on Plate 2 (Fig.2). The two piers supporting the B.M.Z. and Q.H.M. instruments are shown in Plate 3 (Fig.2).

PROGRAMME OF INVESTIGATION AND STAFF

Some intermittent recordings of horizontal intensity and periodic absolute observations were made by Flower in 1950 (Oldham, 1953). The continuous recording magnetograph was installed in 1951 (Oldham, 1953) and regular controlled recordings commenced in April 1952 (McGregor, 1954). The variometers are controlled by semi-absolute magnetic observations made every seven to ten days. The data obtained are treated by normal observatory techniques and preliminary results are sent by radiogram to the Head Office of the Bureau in Melbourne for monthly publication.

The observatory is operated and maintained by one observer who is relieved after about twelve months' duty. The observers, with their periods of office, since continuous staffing of the observatory commenced, have been:-

April	1950 - May	1951	W.R. Flower.
May	1951 - April	1952	W.H. Oldham.
April	1952 - April	1953	P.M. McGregor.
April	1953 - December	1953	P.B. Tenni.
December	1953 - December	1954	C.L. Robertson.
December	1954 - December	1955	P.E. Mann.

SEMI-ABSOLUTE INSTRUMENTS

Quartz horizontal-force magnetometers (Q.H.Ms.).

General.

Control of the values of declination and horizontal intensity recorded in 1952, was obtained by Q.H.Ms. Nos.177 and 178. The instruments (Plate 3, Fig.2) are of La Cour design and with them it is possible to determine only semi-absolute values of these two magnetic elements. A description of the instruments is given by La Cour (1936).

Yearly comparisons against absolute instruments at the Toolangi Magnetic Observatory enable a check to be kept on drift and any sudden changes in constants.

Procedure for the determination of H.

Horizontal intensity is measured with the Q.H.M. by applying a torsion of 2π radians, and observing the angle ϕ through which the magnet is deflected from the meridian position. This torsion, if applied first in a positive and then in a negative direction, gives twice the required angle (ϕ) and this eliminates any possible error due to residual torsion.

Horizontal intensity observations were generally made once a week, if magnetic conditions permitted, together with observations of declination and vertical intensity. A determination comprised two measurements of H, at an interval of about 5 minutes. Q.H.M. No.177 was used for the first few months and thereafter No.177 and No.178 were used alternately. The Q.H.Ms. drifted during the year and the corrections to International Magnetic Standard (I.M.S.) ranged from -7 gammas to -12 gammas for Q.H.M. No.177 and from -5 gammas to -9 gammas for Q.H.M. No.178. Details concerning these corrections to I.M.S. are given below.

The verniers on the horizontal circle are calibrated to 30 seconds, but it was the practice to estimate readings to 1/10 of a minute. An attached thermometer, which was read at every setting of the magnet, allows a correction to be made for the temperature (t) of the magnet. An induction correction has to be applied and this is dependent upon the angle ϕ between the axis of the magnet and the meridian.

The formula used for the computation of H is:-

$$\log H = C - \log \sin \phi + c_1 t - c_2 H \cos \phi$$

where C = a constant depending on the torsion coefficient of the suspension, the moment of the magnet and the torsion angle (2π).

c_1 = temperature coefficient of the magnet;

t = temperature;

c_2 = induction coefficient of the magnet;

ϕ = deflection angle for 2π torsion in the fibre.

C, c_1 and c_2 are given by the manufacturers of the instruments and were determined by intercomparisons made at Rude Skove.

Procedure for the determination of D.

Declination can be measured with the Q.H.M. provided the collimation error and the error due to residual torsion are known. The total of these two errors may be determined by comparison observations against a standard instrument. The correction is applied to the circle reading obtained when the magnet is in the "zero torsion" position and this, combined with readings made by sighting on an azimuth mark, enables the observer to calculate the declination.

Observations were made at intervals of about a week, if magnetic conditions permitted. Q.H.M. No.177 was used for the first few months, and thereafter No.177 and No.178 were used alternately.

An observation consisted of two sets, one before and one after the H observations. Each set consisted of three settings on the magnet together with azimuth mark readings. Corrections of +0.8 minutes for Q.H.M. No.177 and -9.8 minutes for Q.H.M. No.178 were applied to reduce observed values of declination to I.M.S. The determination of these corrections to I.M.S. is described below.

The small horizontal circle, open scale and high scale value of the telescope make the determination of declination with the Q.H.M. less accurate than with an absolute magnetometer.

Magnetometric zero balance (B.M.Z.).

General.

Vertical intensity was measured directly with B.M.Z. No.64 (Plate 3, Fig.2). This instrument, which is fully described by La Cour (1942), comprises an indicating magnet with optical system, and two other magnets to neutralise the vertical field on the indicator. The upper fixed "field" magnet neutralises the greater part of the field by producing an opposing field (Z_c), while the lower adjustable "turn" magnet allows for final exact compensation by producing an additional field (Z_t). The vertical intensity is then the total of the fields due to the two magnets. Corrections for temperature (t) and the rate of change of temperature (dt) have to be applied.

The indicating magnet is so fashioned that it is exactly horizontal when in a neutral field. The scale division in the eyepiece against which the indicating mark rests when the magnet is horizontal, is the "neutral division". This is controlled by a prism, which bears against a spring, in the optical path, and is liable to sudden small changes, thereby necessitating frequent determinations of the "neutral division". There was a probable change in the constant Z_c (or Z_t) during transport of the B.M.Z. during field work in November 1952.

Procedure for the determination of Z.

Determination of this element consisted of two sets of observations, one before and one after the declination observations. A set consisted of the following operations:-

Firstly, determination of the "south" position, i.e. the orientation of the B.M.Z. in which the indicating magnet is most sensitive.

Secondly, a check determination of the "neutral division" by taking readings at "north" and "south" positions.

Thirdly, four readings, at two-minute intervals, of time, temperature and turn magnet.

No correction to I.M.S. was applied to the observed values because no inter-comparisons have been made (see below).

The formula used in the computation of Z is:-

$$Z = Z_c + Z_t - \alpha t - 2\alpha \Delta t$$

where Z_c = constant field produced by the fixed magnet;

Z_t = variable field produced by the turn magnet;

t = temperature of fixed magnet;

Δt = rate of change of temperature shown by the fixed magnet thermometer;

α = temperature coefficient of B.M.Z. as a whole; combines the temperature coefficients of both magnets and the materials of the B.M.Z.

COMPARISON OF SEMI-ABSOLUTE INSTRUMENTS

The Q.H.M. and B.M.Z. instruments used for magnetograph base-line control are semi-absolute types and liable to drift. Frequent inter-comparisons are therefore necessary to keep track of their correction to I.M.S.

A set of Q.H.Ms. comprises three tubes, each with magnet and mirror assembly, which are used with one circle and telescope. All three instruments (Nos.177,178 and 179) were at the island in April 1952. Simultaneous inter-comparisons in horizontal intensity between No.179 and each of the other two in turn, were made at this time (Ervin, 1953). This gave the differences between the three instruments. No.179 was then returned to Australia and compared with Askania magnetometer No.508810 at the Toolangi Magnetic Observatory to determine its I.M.S. correction. From this it was possible to calculate the I.M.S. corrections as at April 1952, for the two instruments left at the island.

Prior to the relief operations in April 1953, No.179 was again compared at Toolangi and its drift determined. At the island, inter-comparisons during the year between Nos.177 and 178, using the magnetograph base-lines as a reference, enabled a record to be kept of their differences. During the relief operations in 1953, No.178 was replaced by No.179. The former was subsequently compared with the magnetometer at Toolangi, and No.179 was compared at the island with No.177. From the results of these inter-comparisons, drift curves were drawn for all three Q.H.Ms. The corrections to be applied throughout 1952 were obtained from these curves.

The drifts of the three Q.H.Ms. in 1952 were as follows, No.177, five gammas; No.178, four gammas; No.179, five gammas. These drifts were all in the same direction and represented a numerical increase in the negative correction to I.M.S. for all three instruments. The drifts correspond to decreases in the moments of the magnets, i.e. to changes in the constant C in the formula for the computation of H.

For declination, it is desirable to observe the I.M.S. correction directly rather than to compute it, as the correction for residual torsion depends on the horizontal intensity. The declination correction for Q.H.M. No.177 was determined at Macquarie Island in April 1952, by comparison with Askania declinometer No.508810 from Toolangi

Observatory. This gave a correction to I.M.S. of +0.8 minutes of arc. Subsequent use of Nos. 177 and 178 during the year, including sets of intercomparisons, gave an I.M.S. correction of -9.8 minutes of arc for Q.H.M. No. 178.

VARIATION INSTRUMENTS

General.

The magnetograph is of La Cour design, of normal sensitivity, and has a recording speed of 15mm per hour. It comprises a declinometer, horizontal-intensity variometer and vertical-intensity balance. The arrangement of the variometers and recorder is shown in Plate 3, Fig. 1. A complete description of the three variometers and recorder can be found in the literature (La Cour, 1930), (La Cour and Laursen, 1930).

Time marks are put on the magnetograms by means of contacts on the pendulum clock which close every five minutes. The hour is marked using two extra contacts; one before the hour and one after the hour. When these contacts close they light a separate time-mark lamp, which is placed behind the recorder lamp. Time marks are obtained from all mirrors in each variometer. Hence there is a set of time marks on the record parallel to each base line and a set that follows each magnet spot. Those from the temperature mirrors have been made too weak to record. Both sets of time marks are essential because the magnet spots identify the central main trace and are free from parallax. They are therefore used whenever possible. However, during disturbed periods when the main traces go off scale and reserve traces are recorded, the base-line time marks must be used.

Daily chronometer comparisons were made with time signals from radio station WWV. This allowed the pendulum clock to be kept well within plus or minus half a minute, even though temperature variations were large enough to produce erratic rates.

Temperature control of the magnetographs was effected by making daily readings of the thermometers in the H and Z variometers. The thermal strips with attached prisms, which provide temperature compensation in the H and Z variometers, give a photographic record of temperature changes. As the external temperature fluctuations were often rapid and up to 5°C. in a day, it was necessary to obtain hourly temperatures from the photographic temperature record.

Horizontal-intensity variometer.

Scale values.

Determination of scale values was made as often as possible and averaged once every ten days. A standard Helmholtz-Gauguin coil giving a uniform central field of 7.49 gammas per milliampere was used. Positive and negative currents of 15mA for intervals of a few minutes each were used to produce a spot on each side of the normal trace on the magnetogram.

Table 2 gives the observed scale values for 1952. There were no scale-value changes and the adopted value is the mean of the observed values. No variation of scale value with ordinate has been used.

Temperature compensation.

In the La Cour H variometer, movements of the horizontal intensity trace due to the effect of temperature on the magnet can be compensated by means of a bimetallic strip of adjustable length, with a prism at the end. When the strip is of correct length and operates in the correct sense, movements of the recording spot, due to movements of the magnet caused by temperature, are exactly counteracted by the motion of the prism. Thus it is possible for there to be no variation of recorded ordinate with temperature.

However, when the initial observed base lines were plotted against temperature it was found that the H variometer had a large temperature coefficient. Several adjustments were made in 1952 and 1953 to reduce this coefficient. Until 20th July, 1952, one degree Centigrade increase in temperature decreased the ordinate by 13.5 gammas. Thereafter, for the remainder of 1952, a temperature increase of one degree Centigrade increased the ordinate by 5.6 gammas.

Orientation.

When the H variometer was originally assembled the magnet was aligned approximately in the magnetic prime vertical. No opportunity presented itself during 1952 to make accurate tests for any departure from true orientation.

Base lines.

Table 7 shows the observed and adopted base-line values for H, corrected to I.M.S.

Because of the irregular intervals between the absolute determinations, it was not possible to use an exact statistical method for the adoption of base-line values. Generally, the time of shifts was fixed first, in most cases by reference to the log of adjustments, but in a few cases by inspection of the plotted values only. The mean of the observed values for each period was taken as the adopted base line. Periods of adjustments of some days duration in July and August were uncontrolled and are indicated in foot-notes to the tables.

Because the H variometer had a large temperature coefficient during 1952 and because of frequent large temperature fluctuations, it was essential to calibrate the H temperature scalings. The corrections were derived directly from a graph prepared in terms of temperature ordinates. Analysis of plotted values of temperature ordinate against simultaneous thermometer readings revealed that, corresponding to a given temperature, four spontaneous shifts occurred in the temperature ordinate during the period August to November, 1952.

The total shift over this period increased the temperature ordinate at 0°C. from 49.75mm to 51.21mm as determined by least squares analysis. This is equivalent to 18 gammas in the H base line. Although the range of the observed base lines over this period is of the same order, it was only possible on one occasion to make a base-line change at the same time as a shift occurred in the temperature curve. Thorough examination has not revealed the reason for these shifts.

Declination variometer.

Scale values.

The dimensions of the optical components and the distances between the different elements were obtained in 1952. Two series of torsion observations were made to determine the scale value. As a check, one determination was made with the Helmholtz-Gauguin coil from the H variometer. The results and the adopted values are shown in Table 1.

Orientation.

When the variometer was installed, the magnet was aligned approximately in the magnetic meridian. There was no opportunity to test the orientation during 1952, but torsion observations for D scale values showed no appreciable misalignment of the magnet.

Base lines.

The observed and adopted base-line values are listed in Table 5. A statistical method for the adoption of base-line values could not be used because of the irregular intervals between the absolute determinations. In most instances the times of shifts were fixed by reference to the log of adjustments and in others by inspection of the plotted values only. The mean of observed values for each period was taken as the adopted base-line value for that period.

Adjustments were made over periods of several days during July and August, and base lines were uncontrolled during those periods.

Vertical-intensity variometer.

Scale values.

A coil similar to that on the H variometer is used for scale-value determinations. These were made concurrently with the H scale-value determinations, using the same controls.

The observed and adopted scale values are shown in Table 3. There is one scale-value change, and this was selected by analysis to give the same weighted value for the year as the mean observed value. A gradual drift occurred during the latter part of the year, with increasing scale value. This was probably due to the effect of moisture on the knife-edges. A modification to the balance was made in 1953 to enable frequent changes of the drying agent to be made without disturbing the elements in the optical path.

Temperature compensation.

An optical arrangement similar to that in the H variometer allows for exact temperature compensation in the Z balance. Analysis of all base-line observations showed that this instrument was fully compensated during the year.

Orientation.

When the Z variometer was installed the magnet was aligned horizontally. No accurate test could be made in 1952 to check the orientation.

Base lines.

Table 9 shows the observed and adopted base-line values of the Z variometer. These values indicate a drift in the B.M.Z. during the period August 1952 to January 1953. There were no adjustments to the Z balance during this period but a base-line change coincides with resumption of normal absolutes following use of the B.M.Z. in the field in November 1952. This has been ascribed above to a change in the constants of the B.M.Z. The difference between absolutes preceding and following the field observations is 12 gammas; the increase in base-lines from August 1952 to January 1953 is of the order of 30 gammas. The B.M.Z. therefore drifted by about 18 gammas during the period, i.e. at a rate of about $3 \frac{1}{2}$ gammas per month.

Two base lines have been adopted for this interval, assuming that the change occurred during the field work. The scatter about the two adopted values for this period is of the order of 5 or 6 gammas, which is not excessive, as a single base-line determination has an accuracy of about ± 4 gammas.

Magnetogram scalings.

Mean ordinate scalings of all elements were made for intervals bounded by successive hour marks. The time used was G.M.T. and the results were tabulated on standard forms. Scalings were also made of the instantaneous maxima and minima for each Greenwich day and the times of occurrence. Horizontal and vertical intensity scalings were made in millimetres, and declination scalings were converted directly to minutes of arc using an appropriate table.

Shrinkage correction.

All scalings for tabulations, base lines and other determinations are corrected for shrinkage or expansion of the photographic paper. Immediately after the record was removed from the recorder drum each morning it was marked in three places, on the reverse side, with a pricker bar. The pins in the bar are so arranged that they can be easily identified, and the distance between different pins is known. Thus at any subsequent date, measurement of the pin marks on the magnetogram determines the amount of shrinkage or expansion relative to the time at which the trace was recorded.

BASIC HOURLY VALUES AND ASSOCIATED MEANS

Basic hourly values.

Hourly values of magnetic declination, horizontal intensity and vertical intensity are given in Tables 15 to 23, 24 to 32 and 33 to 41 respectively. The values are the means for successive hourly periods commencing at 00 hours G.M.T.

The values for vertical intensity are expressed in a numerical sense without sign; the vertical intensity is algebraically negative at Macquarie Island. Declination is easterly at this station and therefore positive; the listed values are therefore also correct algebraically.

Scalings, tabulations and means were carried out by the observer at the island and were subsequently checked by computing staff at the Melbourne office of the Bureau under C.A. van der Waal. Base lines and scale values were computed and checked in the same manner. When the observer (P.M. McGregor) returned to Melbourne with Q.H.M. No.178, the I.M.S. corrections were determined as detailed above. When these were obtained, the H temperature coefficient was determined and the final base-line values were adopted.

The scaled mean hourly ordinates of H and Z were reduced to intensity values by the computing staff at Melbourne. Declination values were derived by applying the base-line values to the already reduced mean hourly scalings.

Maxima and Minima.

The instantaneous values of the extremes of the elements, their time of occurrence and the range for the Greenwich day are shown in the tables which list the mean hourly values. During periods of disturbance, it was often impossible to identify the maximum or minimum, and many of these values are therefore missing, especially those for declination. In such instances the daily range in declination can be assumed to be over 100 minutes of arc.

Computed means.

The mean hourly values for "all days", as well as the mean of the ten least disturbed days, the five international quiet days and the five international disturbed days are also given in Tables 15 to 41. The daily mean values are listed before the maximum and minimum values.

MONTHLY AND ANNUAL MEANS

Monthly means (Table 11) were computed using the mean hourly values of the magnetic elements. The annual means (Table 12) were computed from the monthly mean values.

MAGNETIC ACTIVITY

Lists of K-indices have been published in the monthly Geophysical Observatory Report of the Bureau of Mineral Resources, and are not included in this report. Principal magnetic storms are given in Table 13 and times of sudden commencements and impulses in Table 14. Storms and sudden commencements have previously been published in the Bureau's monthly Geophysical Observatory Report and in the Journal of Geophysical Research (1953). In classifying storms, the degree of activity has been assigned by inspection, with particular reference to the frequency of occurrence of high K-indices, rather than to the maximum K-index alone. Auroral disturbances of short duration occur frequently on otherwise quiet days, and give rise to K-indices of 6 or 7 for one or two three-hourly periods. In most "polar" storms it is only during this time that high K-indices are observed, and the normal disturbances level is less than these indices suggest.

ACKNOWLEDGEMENTS

The assistance is hereby acknowledged of those officers of the Geophysical Section of the Bureau of Mineral Resources who assisted in the production and presentation of the results tabulated in this report.

Prior to sailing for Macquarie Island in 1952, the author discussed and clarified with L.N. Ingall and R.E. Ervin the methods and practices used. On the author's return, the analysis of the data was simplified by help from these officers and also from L.S. Prior. The corrections to the Q.H.Ms. are based mainly on work carried out by R.E. Ervin, W.H. Oldham and P.B. Tenni. Production of the tables in their final form is due to C.A. van der Waal and the computing staff.

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TABLE 1

Observed and adopted D scale-values

Date	Observed D	Adopted D	Method used for determination
1952	Y/mm	Y/mm	
April 21	0.888	0.890	Torsion head deflections
July 10	0.890	0.890	" " "
July 10	0.914	0.890	Helmholtz coil

TABLE 2

Observed and adopted H scale-values
Determinations with Helmholtz coil

Date	Observed h	Adopted h	Adopted value used to	Date	Observed h	Adopted h	Adopted value used to
1952	Y/mm	Y/mm		1952	Y/mm	Y/mm	
April 15	11.56	12.40		August 26	12.37	12.40	
" 21	12.44	12.40		" 29	12.37	12.40	
" 24	12.18	12.40		Sept. 12	12.31	12.40	
May 14	12.72	12.40		" 16	12.51	12.40	
" 23	12.72	12.40		" 18	12.44	12.40	
June 5	12.72	12.40		Oct. 27	12.72	12.40	
" 6	12.58	12.40		" 28	12.86	12.40	
" 9	12.58	12.40		Nov. 4	12.44	12.40	
" 26	12.65	12.40		" 11	12.51	12.40	
July 4	12.37	12.40		" 26	12.24	12.40	
" 21	13.09	12.40		Dec. 1	12.18	12.40	
Aug. 7	12.65	12.40		" 16	12.79	12.40	
" 22	12.31	12.40		" 23	12.37	12.40	

TABLE 3

Observed and adopted Z scale-values
Determinations with Helmholtz coil

Date	Observed Z	Adopted Z	Adopted value used to	Date	Observed Z	Adopted Z	Adopted value used to
1952	Y/mm	Y/mm		1952	Y/mm	Y/mm	
April 15	13.24	13.50		Aug. 29	13.63	13.62	
" 21	13.47	13.50		Sept. 12	13.72	13.62	
" 24	13.47	13.50		" 16	13.55	13.62	
May 14	13.63	13.50		" 18	13.47	13.62	
" 23	13.55	13.50		Oct. 27	13.55	13.62	
June 6	13.47	13.50		" 28	13.55	13.62	
" 9	13.39	13.50		Nov. 4	13.88	13.62	
" 26	13.39	13.50		" 11	13.39	13.62	
July 4	13.47	13.50	24h July 8	" 26	13.72	13.62	
" 21	13.32	13.62		Dec. 1	13.39	13.62	
Aug. 7	13.80	13.62		" 16	13.80	13.62	
" 22	13.39	13.62		" 23	13.63	13.62	
" 26	13.47	13.62					

TABLE 4

Abrupt changes in the adopted Z scale-values

Date	Change from preceding value	Cause of change
1952	Y/mm	
July 19	+0.12	Analysis

TABLE 5

Observed and adopted base-line values for D variometer
(Observed values determined with Elliott Magnetometer)
(East declination)

Date	Observed	Adopted	Adopted value used to	Date	Observed	Adopted	Adopted value used to
1952	° ' "	° ' "		1952	° ' "	° ' "	
April 16	23 24.2	23 24.2	24h, April 17	Sept. 16	23 35.6	23 35.3	
" 24	21.6	23.1		" 18	35.0	35.3	
May 14	22.4	23.1		" 25	35.6	35.3	
" 15	23.0	23.1			35.4	35.3	
" 23	23.6	23.1		Oct. 3	35.0	35.3	
June 5	22.7	23.1		" 13	35.4	35.3	
" 18	23.1	23.1		" 30	34.4	35.3	
" 24	23.2	23.1			34.9	35.3	
" 29	22.8	23.1			35.7	35.3	
July 3	23.5	23.1	24h, July 8		34.4	35.3	24h, Oct. 31
" 11	35.6	35.8		Nov. 4	33.4	34.0	
Aug. 5	35.9	35.8	24h, August 12	" 11	35.0	34.0	
" 20	38.4	35.3		" 26	33.4	34.0	
	37.8	35.3		Dec. 1	34.0	34.0	
" 23	36.4	35.3		" 8	34.8	34.0	
" 26	36.9	35.3		" 16	33.0	34.0	
" 29	35.4	35.3		" 23	33.0	34.0	
Sept. 12	33.4	35.3			33.2	34.0	

TABLE 6

Abrupt changes in the adopted D base-line values
(East declination reckoned as positive; changes below taken algebraically)

Date	Change from preceding value	Cause of change
1952	'	
April 18	-01.1	Scale value observation
July 9	+12.7	Fibre change, scale value observation
Aug. 19	- 0.5	Adjustments to declinometer
Nov. 1	+ 0.7	Analysis

∅ Period 00h August 13 to 24h August 18 was uncontrolled by base-lines

TABLE 7

Observed and adopted base-line values for H variometer
(Observed values determined with QHM's Nos.177,178 & 179)

Date	Observed	Adopted	Adopted value used to	Date	Observed	Adopted	Adopted value used to
1952	Y	Y		1952	Y	Y	
April 16	12878	12878		Sept. 12	13178	13178	
" 24	12878	12878	24h, April 30	" 16	13182	13178	
May 14	12864	12867		" 18	13176	13178	24h, Sept. 21
" 15	12870	12867		" 25	13176	13170	
" 22	12866	12867		"	13172	13170	
" 23	12862	12867		Oct. 3	13171	13170	
June 5	12866	12867		" 13	13166	13170	
" 9	12870	12867		" 30	13168	13170	
" 16	12800	12867		"	13168	13170	
" 18	12872	12867		Nov. 4	13168	13170	
" 24	12864	12867		" 11	13154	13170	
" 29	12869	12867		"	13152	13170	
July 3	12870	12867		" 26	13179	13170	
" 11	12864	12867	24h, July 28	Dec. 1	13174	13170	
Aug. 5	13048	13048	24h, Aug. 12	" 8	13174	13170	
" 20	13196	13194		" 16	13167	13170	
"	13198	13194		"	13167	13170	
" 23	13189	13194	24h, Aug. 23	" 19	13164	13170	
" 26	13174	13178		" 23	13175	13170	
" 29	13178	13178					

TABLE 8

Abrupt changes in the adopted H base-line values

(Horizontal intensity is reckoned as positive; changes below taken algebraically)

Date	Change from preceding value	Cause of change
1952	Y	
May 1	- 11	Analysis
August 1	+ 81	Compensator adjustment
" 19	+146	Variometer adjustments
" 24	- 16	Analysis
Sept. 22	- 8	Analysis - corresponding shift in temperature ordinate

∅ Periods 00h July 29 to 24h July 31 and 00h August 13 to 24h August 18 were uncontrolled by base-lines

TABLE 9

Observed and adopted base-line values for Z variometer
(Observed values determined with BMZ No.64)

Date	Observed	Adopted	Adopted value used to	Date	Observed	Adopted	Adopted value used to
1952	Y	Y			Y	Y	
April 21	-64282	-64300		Sept. 16	-64358	-64356	
" 24	-64298	-64300		" 18	-64358	-64356	
May 15	-64302	-64300		" 24	-64356	-64356	
" 23	-64302	-64300		" 24	-64356	-64356	
June 5	-64298	-64300		Oct. 3	-64308	-64356	
" 24	-64298	-64300		" 13	-64340	-64356	
" 27	-64296	-64300		" 23	-64363	-64356	
July 3	-64296	-64300		" 30	-64358	-64356	
" 11	-64300	-64300		Nov. 4	-64356	-64356	
Aug. 5	-64308	-64300	24h, August 12	" 11	-64356	-64356	24h, Nov. 17
" 20	-64350	-64356		" 25	-64368	-64372	
" 23	-64354	-64356		Dec. 1	-64366	-64372	
" 26	-64348	-64356		" 8	-64370	-64372	
" 29	-64352	-64356		" 11	-64376	-64372	
Sept. 12	-64358	-64356		" 16	-64374	-64372	
	-64360	-64356		" 23	-64374	-64372	

TABLE 10

Abrupt changes in the adopted Z base-line values
(Vertical intensity is reckoned as negative; changes below taken algebraically)

Date	Change from preceding value	Cause of change
1952	Y	
August 19	-56	Adjustments to balance
Nov. 18	-16	Consequent to field use of BMZ
∅ Period 00h August 13 to 24h August 18 was uncontrolled by base-lines		

TABLE 11

Summary of monthly mean values

Month	D		H	Z	D		H	Z
	°	'	Y	Y	°	'	Y	Y
1952			All Days				Ten least disturbed days	
April	24	02.9	13346	-64563	24	02.8	13370	-64564
May	24	03.1	13341	-64560	24	03.5	13374	-64563
June	23	59.9	13361	-64558	23	59.6	13374	-64562
July	24	05.0	13363	-64548	24	05.0	13372	-64553
August	24	05.2	13371	-64544	x		x	x
September	24	05.3	13348	-64546	24	05.2	13364	-64545
October	24	05.8	13345	-64536	24	06.1	13366	-64539
November	24	05.7	13354	-64534	24	05.4	13379	-64534
December	24	06.2	13348	-64538	24	06.0	13367	-64538
			Five international quiet days				Five international disturbed days	
April	24	02.7	13376	-64564	x		x	x
May	24	03.2	13371	-64564	x		13261	-64553
June	23	59.8	13375	-64559	24	00.9	13313	-64566
July	24	05.2	x	-64548	x		13326	-64529
August	x		x	x	x		x	x
September	24	05.3	13370	-64546	x		13310	-64554
October	24	06.1	13366	-64531	x		13303	-64543
November	24	05.6	13381	-64534	24	06.1	13315	-64541
December	24	06.1	13372	-64540	24	08.9	13301	-64543
			x Insufficient data					

TABLE 12

Summary of annual mean values
(from April to December)

1952	D		H	Z
	°	'	Y	Y
All days	24	04.3	13353	-64547
Ten least disturbed days	24	04.2	13371	-64550
Five international quiet days	24	04.2	13373	-64548
Five international disturbed days	x		13304	-64547
			x Insufficient data	

TABLE 13
Principal magnetic storms

Greenwich Date	Storm time		Sudden commencement				Degree of activity ϕ	Gr. day	Maximal activity							
									Amplitudes Z				K-scale 0-9	Ranges		
									D	H	Y	Z		K-index	D	H	Z
	G.M.T. of beginning	G.M.T. of ending	Type	D	H	Y	Z	Gr. 3-hour period	K-index	D	H	Z				
1952	h m	d h														
March	30 13 19	10 17	SSC	+ 7	+118	- 97	A	30	8		2039	1130				
April	21 05 ..	22 15	SSC	..	..	..	C	21	7		1231	715	
April	27 22 14	08 22	SSC	+ 3	- 25	+ 19	B	29	8	100	1611	1098				
a May	18 00 ..	20 18	SSC	..	..	..	C	18	6		821	611	
b May	26 08 ..	31 ..	SSC	..	..	..	B	27	7		1166	(593)	
								28								
								30								
June	8 05 ..	11 18	SSC	..	..	..	C	9	7	71	1230	658	
June	14 07 ..	17 20	SSC	..	..	..	C	14	7		828	498	
c June	22 07 ..	24 21	SSC	..	..	..	B	24	7		(1075)	(505)	
July	5 04 ..	05 16	SSC	..	..	..	A	5	8		1453	1088	
July	20 11 06	22 13	PSC	+ 20	-545	+408	B	21	8	(120)	1406	570				
d August	17 04 ..	20 14	SSC	..	..	..	C	17	7		(1034)	513	
e August	31 22 ..	03 19	SSC	..	..	..	B	20	7	(87)	(1245)	(585)	
Sept.	7 17 ..	10 16	SSC	..	..	..	A	1	7	(102)	1518	836	
Sept.	28 03 30	30 19	SSC	..	..	..	A	8	8		1752	1038	
Oct.	3 12 06	06 19	PSC	+ 9	-192	+163	A	29	8		1286	599				
Oct.	25 10 17	27 14	SSC	..	..	..	C	5	8		1586	744	
Oct.	29 09 ..	02 18	SSC	..	..	..	B	26	7	143	1442	860	
								30	7							
								31	7							
Nov.	26 06 ..	29 00	SSC	..	..	..	A	31	8		1504	713	
Dec.	1 08 30	05 15	SSC	..	..	..	B	1	7	137	1154	543	
Dec.	13 04 ..	13 17	SSC	..	..	..	C	2	7		833	318	
Dec.	24 01 15	25 17	SSC	- 3	+ 11	- 12	C	4	7	99	926	500				
Dec.	28 11 55	02 20	PSC	(- 4)	-120	+ 91	B	24	7	80	1636	676				
								29	7							
								30	7							
								31	7							

ϕ Severe storm classified A. Moderately severe storm classified B. Moderate storm classified C.
a Commencement obscured during record changing.
b Record incomplete on May 31 from 06h.
c Record incomplete on June 23 from 10h.
d Records incomplete during adjustments to variometers on August 18, 19.
e Record incomplete on September 2 from 04h.

TABLE 14

Sudden Commencements
(From April to December)

Month	Day	Time	Type
		h m	
March	30	13 19	Storm Sudden Commencement
April	23	09 45	Polar Sudden Commencement
	27	22 14	Storm Sudden Commencement
	28	10 52	Polar Sudden Commencement
May	13	13 05	Polar Sudden Commencement
	19	04 16	Polar Sudden Commencement
June			N i l
July	01	20 32	Storm Sudden Commencement (Small initial impulse)
	11	04 24	Polar Sudden Commencement
	20	11 06	Polar Sudden Commencement
	28	06 40	Sudden Impulse
August			N i l
September	19	20 59	Sudden Impulse
	20	19 41	Storm Sudden Commencement
October	03	12 06	Polar Sudden Commencement
	09	05 28	Sudden Impulse
	21	10 10	Storm Sudden Commencement (Small initial impulse)
	26	02 04	Polar Sudden Commencement
November	05	13 16	Polar Sudden Commencement
	15	04 54	Sudden Impulse
	17	08 34	Polar Sudden Commencement
	18	03 25	Sudden Impulse
December	08	14 23	Polar Sudden Commencement
	12	12 24	Polar Sudden Commencement
	13	20 01	Sudden Impulse
	24	01 15	Storm Sudden Commencement
	28	11 55	Polar Sudden Commencement

TABLE 15

HOURLY VALUES OF DECLINATION

23° East plus tabular quantities expressed in tenth of minutes of arc

G.M.T. used

APRIL 1952

Day	23° East plus tabular quantities expressed in tenth of minutes of arc																								24	Mean	Maximum		Minimum		Range		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23			h	m	h	m		h	m
1	(574)534	567	564	569	589	589	590	436	614	531	718	816	649	703	704	685	642	680	698	632	626	625	602	573	643	(11	01	14,88)	07	20	271	(1217)	
2	529	589	687	598	653	640	600	493	592	624	625	636	606	625	609	615	580	685	615	663	694	813	756	702	629	664	17	03	913	08	30	359	511
3	564	627	619	583	547	566	570	654	655	658	690	839	651	738	646	609	610	574	629	610	626	609	600	624	614	10	55	1071	01	37	384	687	
4																																	
5																																	
6																																	
7																																	
8																																	
9																																	
10																																	
11	*	*	*																														
12	*	*	*																														
13	*	*	*																														
14	*	*	*																														
15	*	*	*																														
16	*	*	*																														
17	*	*	*																														
18	*	*	*																														
19	*	*	*																														
20	*	*	*																														
21	*	*	*																														
22	*	*	*																														
23	*	*	*																														
24	*	*	*																														
25	*	*	*																														
26	*	*	*																														
27	*	*	*																														
28	*	*	*																														
29	*	*	*																														
30	*	*	*																														
Mean	613	631	655	660	645	629	612	612	605	629	553	629	630	632	639	628	646	617	622	622	635	627	616	596	629				DESIGNATIONS				
Mean *	627	650	665	669	659	643	632	632	621	620	619	615	616	624	627	636	638	626	620	612	609	608	603	601	628	#	Ten	least	disturbed	days	338		
Mean †	623	648	664	676	671	649	621	640	629	641	610	585	609	617	627	628	637	635	623	605	608	609	595	599	627	†	Five	international	quiet	days			
Mean ‡																										‡	Five	international	disturbed	days			
																										(	Approximate					

Continuous recording started 7th April, 1952

Insufficient data

TABLE 16

HOURLY VALUES OF DECLINATION

25° East plus tabular quantities expressed in tenth of minutes of arc

MAY 1952

G.M.T. used

Day	25° East plus tabular quantities expressed in tenth of minutes of arc																								24	Mean	Maximum		Minimum		Range
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23			h	m	h	m	
1	427	562	589	605	617	652	547(603)	560(792 632)	605	711	725	651	644	661	661	635	645	626	572	645	626	572	645	626	572						
2	(445)501	538	506	640	548	607(547 471)	671	(712)	660	660	921	804	669	651	643	651	704	638	550	649	631	550	649	631	550						
3	557	527	553	557	578	400	599	518 603	634(614 738)	661	669	690	700	731	680	801	988	805	574	649	574	649	574	649	574						
4	532	613	638	624	530	599	646	514 542	550(694 738)	614	761	629	570	679	652	640	676	740	698	649	585	698	649	585							
5	576	469	639	694	661	580	609	661(583)	599	587(599)	656	704	653	629	642	643	614	643	617	652	648	615	652	648	615						
6	640	671	700	677	664	572	585(712)685	738	663	599	602	569	620	624	700	656	626	613	606	612	629	630	612	629	630						
7	629	648	658	661	632	632	718	627 798	697	715	532(716)	624	739	679	593	(783	801	792)	703	730	681	703	730	681							
8	635	612	654	633	660	661	596	585 607	614	614	487	593	624	614	630	639	632	615	615	615	615	615	615	615	615						
9	638	667	672	670	661	652	651	651 642	631	635	638	640	642	643	642	634	632	630	630	630	630	630	630	630	630						
10	656	674	684	672	664	648	640	640 640	632	625	625	632	614	633	643	640	637	632	625	624	619	612	615	615	615						
11	632	648	661	666	664	649	640	643 635	631	635	631	632	632	640	636	638	669	625	615	620	621	617	619	619							
12	648	674	691	704	733	694	653	624 621	621	631	632	633	632	640	636	638	669	625	615	620	621	617	619	619							
13	643	661	668	668	660	652	651	662 634	606	594	615	614	667	617	646	644	633	623	607	616	651	625	617	617							
14	(634)675	703	704	687	677	629	629	645 632	616	584	594	625	638	640	646	640	638	632	631	628	623	616	628	623	616						
15	624	635	651	657	653	645	640	638 633	628	623	615	607	562 602	598	615	625	624	623	629	624	619	603	624	619	603						
16	617	643	661	661	659	651	646	648 643	635	630	624	596	599	594	613	620	620	622	623	629	622	614	621	622	614	621					
17	630	643	659	666	660	656	661	657 624	618	623	614	624	624	616	624	617	632	614	598	612	614	598	612	614	598	612					
18	604	635	682	688	685	704	697	623 595	624	605	596	565	607	657	640	633	649	640	627	615	637	615	615	637	615						
19	615	629	667	688	643	675	678	592 478	474	580	612	643	625	617	615	727	725	643	624	624	633	617	615	627	617						
20	633	667	665	676	656	654	632	592 562	549	527	611	509	555	649	703	637	643	633	625	627	633	633	624	633	633						
21	638	660	676	667	682	701	644	624 551	425	592	625	516	624	596	622	624	625	623	623	630	623	615	624	633	633						
22	640	655	661	660	656	630	630	616 612	615	587	581	615	626	632	632	640	639	634	630	625	624	614	605	624	614	605					
23	611	626	643	654	648	641	634	632 637	629	612	640	631	628	638	642	649	644	626	635	640	625	625	616	625	625	616					
24	625	657	674	643	648	656	607	594 604	632	624	607	465	570	604	607	586	624	616	623	621	630	633	622	630	633						
25	633	664	705	731	696	642	656	649 553	571	550	595	648	693	651	639	634	642	637	632	625	623	615	615	623	615						
26	631	651	661	659	649	643	634	635 648	632	562	598	605	551	661	627	612	650	657	(792)769	649	612	650	657	(792)769	649						
27	657	663	658	661	651	648	642	614 568	525	678	666	655	631	702	695	651	683	685	694	671	694	671	590	694	671						
28	640	612	631	616	550	621	560	527 569	632	605	712	661	674	624	661	642	783	674	682	728	783	688	644	783	688						
29	648	609	595	521	643	570	551	652(720)	591	666	621	614	634	630	649	640	642	642	648	642	649	631	625	649	631						
30	(578)607	594	647	618(478)	649	643	634	635 648	632	562	598	605	551	661	627	612	650	657	(792)769	649	612	650	657	(792)769	649						
31	657	663	658	661	651	648	642	614 568	525	678	666	655	631	702	695	651	683	685	694	671	694	671	590	694	671						
Mean	620	628	652	655	649	633	632	617 608	598	624	627	605	630	628	645	649	648	634	642	654	654	631	612	654	631	612					
Mean #	634	655	669	672	668	655	644	641 634	625	614	618	620	622	625	632	636	634	629	624	628	626	618	616	626	618	616					
Mean /	635	655	666	664	659	645	641	639 634	628	619	615	616	607	620	625	634	633	631	627	628	624	618	616	624	618	616					
Mean #	Insufficient data																														
Mean #	# Ten least days disturbed																														
Mean #	/ Five international quiet days																														
Mean #	# Five international disturbed days																														
Mean #	() Approximate																														

DESIGNATIONS
 # Ten least days disturbed
 / Five international quiet days
 # Five international disturbed days
 () Approximate

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TABLE 20

HOURLY VALUES OF DECLINATION

23° East plus tabular quantities expressed in tenth of minutes of arc

SEPTEMBER 1952

G.M.T. used

Day	Hour																								Mean		Minimum		Range			
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	h ^m	h ^m	h ^m	h ^m			
1	691	648	672	664	682	719	613	784	782	712	729	632	713	707	585	618	631	614	602	636	628	584	596	663	663	12 29	11 43	09 35	276	867		
2	630	673	695	677	673	600	596	614	567	682	658	676	727	716	672	665	693	739	671	637	620	604	572	602	647	14 36	805	10 40	466	339		
3	605	647	658	631	693	688	677	666	596	551	534	636	682	631	724	700	581	656	648	658	640	599	620	646	651	13 58	826	09 07	442	384		
4	652	667	669	694	681	693	684	634	650	664	648	646	685	622	618	575	486	606	604	644	618	610	614	640	623	12 39	791	13 12	600	233		
5	656	668	674	694	703	702	674	666	679	682	642	646	632	642	618	632	622	611	610	614	640	640	613	613	632	12 14	558	12 14	558	319		
6	605	635	660	694	703	690	694	672	699	682	658	650	640	631	631	647	636	623	632	629	666	640	639	739	660	23 33	(831)	19 01	512	817		
7	640	656	671	684	694	690	684	658	694	685	684	669	624	594	613	624	618	780	648	631	632	642	630	575	679	11 56	1170	07 50	353			
8	702	623	604	685	620	677	627	627	613	700	713	705	649	742	703	628	699	680	629	637	652	638	588	549	637	11 05	1203	08 09	184	1019		
9	529	649	677	622	718	702	467	605	615	704	743	809	672	753	674	651	648	647	653	636	637	614	608	604	652	14 36	805	10 40	466	339		
10	593	632	664	662	694	708	593	672	671	638	536	605	618	649	729	632	606	657	647	647	644	648	630	647	650	12 29	962	12 47	456	506		
11	554	667	663	632	641	647	691	688	632	651	640	704	703	702	608	612	614	646	620	653	657	634	620	627	648	03 58	700	20 46	566	134		
12	647	665	682	691	691	676	664	664	664	656	647	637	627	657	656	647	643	640	640	632	613	600	604	618	651	16 06	1109	14 37	442	697		
13	656	673	676	685	647	634	682	645	624	600	580	566	600	580	566	749	810	636	649	656	655	654	631	622	651	15 28	764	09 40	455	309		
14	632	643	663	676	682	666	658	656	618	544	621	638	640	635	657	735	649	654	662	700	673	640	628	614	652	03 50	713	09 54	503	210		
15	629	652	664	693	704	685	674	658	659	595	557	640	662	648	656	645	649	654	653	648	628	648	674	674	652	02 52	711	10 50	470	257		
16	663	673	700	702	700	696	685	664	663	651	595	586	602	631	667	645	664	672	656	655	629	605	592	603	651	04 10	714	22 04	571	143		
17	664	684	700	706	708	700	648	664	657	648	648	630	638	639	643	673	640	645	654	648	633	612	614	611	653	15 38	707	23 04	470	257		
18	638	664	690	701	700	684	672	658	657	656	653	649	648	648	650	656	646	656	648	639	595	549	559	560	651	03 24	727	23 04	470	257		
19	648	685	712	721	718	703	693	680	672	622	632	631	640	639	653	657	657	656	649	656	638	596	611	634	659	10 16	826	09 31	591	224		
20	577	651	685	763	764	738	708	680	667	622	632	631	640	639	610	651	657	640	619	616	605	610	620	655	656	03 48	826	09 31	591	224		
21	658	682	697	708	716	711	698	688	674	693	709	631	639	637	610	651	657	640	643	637	622	609	610	632	656	03 48	720	09 39	564	156		
22	673	687	697	708	716	711	694	674	672	636	635	641	628	632	631	666	649	644	643	637	622	609	610	632	656	03 48	720	09 39	564	156		
23	654	684	707	717	727	728	699	685	658	657	581	595	628	632	640	673	620	638	587	607	611	619	635	648	651	15 25	739	10 44	479	260		
24	680	709	716	713	698	684	675	665	666	664	645	631	640	643	644	644	634	634	640	664	638	580	584	551	653	01 56	721	23 34	504	217		
25	533	537	549	626	729	753	770	753	656	655	667	650	636	626	655	644	646	647	643	638	618	613	621	638	646	05 12	876	00 21	492	384		
26	658	692	695	692	673	622	710	746	(834)	737	900	744	640	655	700	672	672	632	613	619	609	620	632	683	10 20	1082	09 09	391	691			
27	648	685	699	736	712	728	694	667	664	685	707	613	610	591	610	640	552	498	502	631	544	615	602	600	635	08 26	1021	09 04	275	691		
28	567	596	675	755	770	703	596	698	(834)	798	083	789	702	664	704	666	720	672	649	622	679	737	647	596	697	10 14	1103	00 09	174	746		
29	553	510	694	699	690	709	724	707	706	688	652	630	702	664	704	666	720	672	673	649	620	603	611	595	652	10 14	1103	00 09	174	929		
Mean	622	649	671	689	690	690	671	672	670	658	643	635	629	633	627	656	653	649	637	641	631	620	613	617	653	DESIGNATIONS						
Mean # a	650	669	686	699	701	690	674	665	651	619	615	634	642	642	660	672	658	656	652	651	628	610	611	630	652	#	Ten least disturbed days					
Mean †	657	675	694	702	703	693	673	665	663	645	636	629	629	643	651	662	651	651	651	642	624	606	604	617	653	†	Five international quiet days					
Mean ‡																										†	Five international disturbed days					
																											()	Approximate				

Insufficient data

a Means of 9 values

TABLE 21

HOURLY VALUES OF DECLINATION

23° East plus tabular quantities expressed in tenth of minutes of arc

G. M. T. used

OCTOBER 1952

Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	Maximum	Minimum	Range	
1	625	632	666	696	642	686	685	629	664	671	645	625	638	656	647	684	680	665	648	658	631	610	599	596	619	649	09 46	09 09	486	390
2	623	654	697	721	729	697	716	691	681	621	643	619	638	606	611	638	646	608	601	611	639	627	605	614	647	647	04 31	13 53	451	286
3	630	659	708	730	699	711	693	684	674	666	664	646	626	525	621	736	377	517	586	648	583	646	663	667	643	643	15 03	16 29	111	826
4	586	607	737	763	734	785	766	854	883	(845)	626	620	611	649	653	856	592	621	586	567	577	603	586	502	675	681	07 36	14 41	387	
5	647	678	700	713	640	695	905	709	(007)	771	(820)	640	562	597	597	(645)	559	585	774	604	628	629	631	598	681	651	09 11	09 35	(462)	(615)
6	586	638	587	603	711	656	643	659	746	668	635	658	748	618	734	579	693	661	655	653	628	607	602	614	654	654	03 18	10 55	440	306
7	655	688	724	737	736	718	682	632	668	659	602	632	629	656	702	680	616	602	647	628	592	586	608	630	654	654	03 18	10 55	440	306
8	655	702	712	721	702	683	(720)	689	675	673	667	676	698	658	624	665	637	645	652	650	636	640	632	675	656	671	20 45	09 39	383	524
9	655	684	737	757	729	701	702	681	657	610	610	656	658	657	656	654	645	651	646	664	818	753	633	637	664	664	09 20	13 05	414	395
10	673	684	701	703	693	676	684	668	668	624	648	620	676	748	679	681	667	648	651	636	622	609	626	620	660	660	13 12	05 51	515	304
11	647	721	701	703	693	676	668	668	668	667	664	650	656	666	665	676	656	637	640	631	609	601	606	632	658	658	03 34	21 37	577	134
12	694	696	703	701	691	673	646	677	675	666	648	632	658	666	665	656	709	682	648	640	628	619	623	647	663	663	16 29	06 20	599	132
13	670	693	704	701	691	673	668	662	657	657	656	657	619	632	648	656	665	645	640	654	623	611	621	638	663	663	02 04	21 58	604	113
14	668	701	705	698	692	682	668	662	657	667	659	642	680	673	659	651	640	676	651	640	624	612	604	612	669	669	10 30	22 28	566	157
15	666	700	717	726	729	713	702	684	684	667	682	666	680	682	652	665	621	619	608	608	610	583	611	629	666	666	13 21	19 26	535	300
16	674	695	734	753	749	737	725	693	675	685	643	656	652	682	652	665	647	643	636	620	605	596	604	622	667	667	11 21	09 19	449	507
17	695	723	757	737	728	714	719	684	668	640	620	628	611	602	647	665	597	603	626	614	594	542	552	685	647	647	14 30	14 54	205	728
18	683	711	736	747	738	727	719	684	670	671	678	682	694	647	633	648	591	499	542	552	685	599	605	633	659	659	02 59	21 20	569	171
19	677	723	729	726	710	703	691	676	673	667	663	658	636	645	655	631	618	593	623	613	604	599	593	615	647	647	03 26	12 51	562	174
20	649	685	711	729	723	717	702	683	672	668	664	659	657	634	629	630	656	631	638	622	605	598	605	629	659	659	04 46	12 31	593	145
21	640	668	705	718	729	720	710	693	680	672	656	655	655	656	649	648	643	640	634	622	605	602	615	647	657	657	11 05	11 11	436	484
22	664	693	719	728	737	727	718	703	697	690	692	643	592	538	623	605	585	587	634	637	584	619	624	626	667	667	09 40	22 44	275	244
23	636	647	462	669	737	727	757	725	680	691	682	688	584	553	664	662	556	647	639	630	638	619	624	647	667	667	03 04	10 05	542	210
24	636	664	706	720	753	738	719	713	674	701	683	666	647	556	664	662	556	647	634	630	624	599	595	614	659	659	14 36	15 50	346	464
25	615	656	692	726	727	721	719	704	688	624	631	611	638	638	638	640	663	636	644	630	624	567	600	627	630	630	14 36	15 50	346	464
26	685	694	708	721	708	689	683	676	664	682	691	649	630	591	673	493	529	595	548	559	589	567	600	627	654	654	11 23	14 39	-38	1431
27	532	657	646	627	647	737	734	718	711	674	704	848	(602)	553	335	(584)	656	610	608	632	629	620	615	656	656	651	11 23	14 39	-38	1431
28	675	717	583	647	767	769	678	756	701	674	704	848	(602)	553	335	(584)	656	610	608	632	629	620	615	656	656	651	11 23	14 39	-38	1431

Mean	654	682	694	713	715	710	706	691	696	667	661	658	642	640	643	654	623	612	630	624	622	612	613	629	658	DESIGNATIONS		
Mean # a	667	694	715	720	718	706	692	679	671	658	659	662	644	647	654	655	654	643	639	627	608	600	606	634	661	# Ten least disturbed days	211	
Mean /	666	698	717	723	718	710	698	680	670	667	663	680	651	651	653	647	642	634	635	624	604	597	605	626	661	/ Five international quiet days		
Mean #	Insufficient data																											
	a Means of 9 values																											
	# Five international disturbed days																											
	() Approximate																											

TABLE 22.

HOURLY VALUES OF DECLINATION

23° East plus tabular quantities expressed in tenth of minutes of arc

NOVEMBER 1952

G. M. T. used

Day	Hour																														Mean	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Range
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29																										
1	562	614	687	732	751	734	704	676	668	659	614	562	610	568	857	749	563	629	643	551	579	562	578	589	648	14	46	1354	10	51	418	936																								
2	624	677	724	743	707	691	715	705	661	660	645	678	633	618	791	687	613	602	593	583	571	568	578	574	652	14	37	1036	21	10	546	490																								
3	610	665	691	717	734	728	683	684	691	669	661	618	607	592	622	637	619	617	619	611	593	593	598	634	645	11	06	762	09	50	481	281																								
4	651	686	731	747	734	732	710	679	672	666	660	652	651	643	652	630	646	643	632	610	598	600	612	630	662	03	01	760	20	28	580	180																								
5	666	707	741	759	754	732	708	687	677	658	652	644	651	662	680	619	643	622	606	573	556	547	557	590	652	03	19	767	21	20	538	229																								
6	640	704	734	717	795	772	759	685	688	664	607	634	(597)	622	591	625	616	619	634	610	580	545	544	582	649	12	13	869	12	20	334	535																								
7	613	664	716	723	723	704	676	673	660	646	635	564	598	618	638	671	681	655	699	763	690	646	641	634	664	19	42	806	11	20	509	297																								
8	625	704	734	734	708	688	691	670	663	618	594	603	637	663	682	671	650	654	611	627	619	636	608	609	655	02	42	758	22	14	509	249																								
9	654	681	706	713	704	701	684	669	663	661	659	651	652	645	645	646	643	654	619	589	574	578	598	618	650	03	00	717	21	02	552	165																								
10	643	682	704	717	713	697	688	669	660	663	660	655	652	651	651	651	652	607	581	589	591	587	620	618	662	03	19	726	18	54	560	166																								
11	679	725	741	743	732	700	681	670	672	667	664	659	651	637	644	644	644	635	617	609	607	609	606	634	661	04	02	752	20	27	596	156																								
12	660	702	733	728	715	696	683	670	665	663	660	642	632	651	652	643	639	629	608	580	564	562	574	605	648	02	45	746	21	48	546	200																								
13	693	690	740	750	753	743	723	707	679	687	637	644	638	642	638	634	627	611	591	571	557	550	581	587	651	03	24	764	21	16	513	251																								
14	635	676	719	741	735	705	684	680	646	645	643	627	624	627	639	653	659	643	596	593	585	564	572	599	646	09	26	944	22	08	553	391																								
15	651	707	751	762	761	724	688	687	689	652	659	652	624	614	580	683	619	619	593	582	585	599	605	631	647	14	57	951	12	41	512	799																								
16	696	717	756	762	760	731	707	671	742	709	627	583	616	641	653	645	628	627	602	664	670	578	637	637	667	09	01	1079	21	38	515	564																								
17	660	712	732	734	723	730	708	708	697	696	636	636	645	639	640	645	628	627	616	601	588	575	583	608	657	03	31	770	21	45	547	223																								
18	644	690	700	741	737	720	689	679	662	659	662	635	627	647	660	682	667	644	618	594	581	575	591	632	656	03	27	753	21	47	557	196																								
19	678	708	732	767	758	733	711	690	676	668	654	650	651	644	636	636	635	627	606	582	571	555	556	607	677	07	45	1202	11	31	350	256																								
20	635	697	733	836	840	785	753	761	798	732	725	643	569	607	626	627	635	667	651	624	600	570	583	(550)	655	05	30	780	21	30	524	852																								
21	584	658	724	749	756	744	716	688	691	687	740	750	(950)	547	(643)	619	611	645	615	592	578	574	572	597	668	12	11	1448	15	59	346	1102																								
22	650	671	705	726	750	749	686	732	712	748	651	660	632	646	625	631	626	625	625	611	592	586	581	582	659	09	44	855	10	21	544	341																								
23	625	647	659	688	701	705	697	708	714	742	651	667	691	589	658	633	634	622	625	618	609	607	607	610	654	09	07	965	13	09	550	445																								
24	632	687	708	712	731	732	724	713	704	641	638	660	667	696	681	629	635	624	619	616	612	608	614	630	663	13	06	748	09	52	505	2413																								
25	659	687	702	708	715	725	714	696	724	(855)	667	675	680	547	597	592	560	576	583	625	751	705	618	683	653	13	07	1135	13	36	428	707																								
26	694	720	747	739	712	780	822	855	812	847	749	686	635	759	606	632	624	661	593	595	589	623	561	576	671	09	52	1161	13	06	435	726																								
27	570	633	652	623	724	722	715	646	679	685	741	686	732	666	565	598	643	643	634	652	635	627	625	626	656	11	41	752	23	28	584	168																								
28	649	652	690	702	720	716	708	704	698	684	699	660	678	674	677	623	613	624	632	610	598	594	596	602	656	11	41	752	23	28	584	168																								
29	634	656	692	725	735	732	721	661	691	678	674	677	623	613	624	654	678	654	632	610	598	594	596	602	656	11	41	752	23	28	584	168																								
30	640	682	716	732	738	724	705	688	687	686	657	645	642	632	649	646	633	631	616	612	601	590	594	612	657			DESIGNATIONS			441																									
Mean	659	698	726	740	732	718	698	683	672	667	649	647	645	646	650	649	642	630	609	590	579	572	588	616	654	*	Ten	least	disturbed			202																								
Mean	657	695	723	730	720	705	689	671	666	664	661	652	648	645	649	648	645	634	611	597	587	587	602	628	656	†	Five	international																												
Mean	606	658	694	725	758	742	722	694	717	733	687	642	624	620	672	650	596	633	612	634	638	616	597	608	661	‡	Five	international																												
Mean	606	658	694	725	758	742	722	694	717	733	687	642	624	620	672	650	596	633	612	634	638	616	597	608	661	‡	Five	international																												

() Approximate

TABLE 23

HOURLY VALUES OF DECLINATION

23° East plus tabular quantities expressed in tenth of minutes of arc

DECEMBER 1952

G. M. T. used

Day	Hourly Values																															24 Mean	Maximum		Minimum		Range
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	h m	h m	h m	h m								
1	652	679	699	731	751	738	726	716	691	643	684	652	626	610	691	545	596	695	672	618	634	607	632	634	662	14 41	14 50	14 50	100								
2	609	688	715	698	749	724	719	691	680	635	661	607	634	716	692	562	578	615	589	627	635	619	639	591	665	14 32	12 72	15 35	-98								
3	601	643	635	655	626	578	700	696	695	672	681	659	654	643	625	602	614	611	612	615	612	625	587	581	634	12 55	768	05 10	447								
4	508	553	602	726	657	675	796	735	662	708	699	803	770	700	705	698	652	653	707	718	733	667	580	543	676	11 29	1101	01 40	155								
5	571	610	607	609	677	675	682	708	697	670	646	665	742	664	661	659	660	646	643	654	646	624	616	607	659	09 17	964	09 11	497								
6	624	653	687	706	678	705	708	703	694	690	677	666	660	662	685	646	661	689	627	624	618	604	634	609	668	04 37	778	17 18	579								
7	619	708	732	739	758	752	730	705	687	671	661	660	654	651	658	653	658	618	624	617	610	592	586	593	602	05 20	777	21 06	579								
8	619	645	688	740	749	765	735	705	701	669	654	643	652	653	682	659	618	624	617	610	592	589	575	592	657	04 59	722	22 59	572								
9	625	656	699	709	724	724	712	699	687	682	677	669	658	659	653	644	645	642	627	610	610	589	575	592	654	04 06	769	17 36	515								
10	649	695	712	732	760	749	724	705	693	682	685	648	628	604	619	641	660	668	585	607	593	583	598	613	660	10 48	830	18 13	557								
11	672	711	725	743	748	703	668	698	716	707	738	687	705	616	606	538	604	627	616	616	606	588	606	605	654	12 34	869	14 56	403								
12	641	670	696	748	740	733	739	708	716	714	708	672	702	607	571	612	575	580	592	596	603	595	612	632	721	10 37	1424	13 08	436								
13	(587)	702	776	748	798	769	847	847	966	981	114	883	702	607	571	651	533	623	614	596	580	573	571	623	651	13 51	714	21 46	526								
14	644	669	694	697	697	702	697	682	678	682	654	659	669	676	659	651	636	613	614	596	594	588	592	628	659	09 35	816	10 01	472								
15	689	708	758	716	740	752	747	678	661	691	617	553	649	645	636	586	671	643	618	586	563	577	607	607	654	11 51	790	15 51	475								
16	668	713	761	732	738	724	714	680	680	633	670	690	591	618	616	586	616	642	622	592	562	538	503	623	670	06 19	804	22 38	483								
17	666	734	766	784	786	748	751	734	724	688	686	654	645	660	651	654	642	593	636	625	586	536	560	600	665	05 20	804	20 59	500								
18	631	703	724	775	781	797	761	722	691	675	669	654	669	668	666	659	645	639	625	609	578	570	579	607	661	03 08	769	21 43	544								
19	651	696	740	758	752	732	707	684	668	667	653	651	645	643	644	651	666	653	631	611	586	573	584	611	673	03 45	803	23 13	563								
20	667	732	773	794	793	771	740	705	685	678	652	662	645	643	644	651	666	653	606	587	579	579	579	(591)	668	03 45	795	23 13	570								
21	641	700	749	787	783	761	732	708	696	696	679	667	654	651	662	661	645	627	632	644	633	602	591	607	661	14 04	787	14 14	484								
22	619	655	678	719	747	748	732	740	732	716	644	640	650	651	609	615	607	610	616	610	604	580	579	575	647	04 00	715	23 07	546								
23	618	658	669	696	707	707	708	707	696	585	662	627	634	650	643	634	634	625	606	598	693	639	581	592	660	13 15	(1018)	14 53	208								
24	608	658	669	709	711	730	740	740	742	711	769	748	651	651	614	474	605	607	606	598	643	624	619	611	659	10 29	883	12 56	473								
25	621	615	662	669	619	725	748	740	722	659	757	690	690	696	670	591	598	643	660	643	644	625	624	616	664	11 24	740	11 50	483								
26	582	618	641	667	696	712	708	709	716	717	744	678	650	633	657	654	680	673	636	646	616	618	631	651	664	23 17	738	22 35	347								
27	658	660	696	717	712	726	690	712	712	701	662	668	654	635	643	636	643	626	651	672	691	643	649	716	668	16 18	1025	17 06	296								
28	661	635	659	697	699	697	696	697	703	697	686	694	648	633	627	562	557	622	(892)	698	652	623	632	604	663	15 25	1032	11 28	491								
29	678	730	680	660	739	743	736	714	703	715	675	716	650	647	624	739	699	677	624	623	615	615	634	617	663	15 25	1032	11 28	491								
30	660	684	703	660	634	664	627	690	680	614	732	741	761	765	740	689	677	571	620	625	625	664	670	642	668	16 18	1025	17 06	296								
31	(629)	627	663	671	687	713	710	651	682	680	667	625	627	644	700	801	651	636	620	625	625	664	670	642	663	15 25	1032	11 28	491								
Mean	632	665	700	715	727	726	723	710	705	692	693	678	663	653	655	633	645	625	633	623	618	601	600	614	662	DESIGNATIONS											
Mean #	634	677	714	734	739	737	720	704	692	684	660	654	654	657	656	647	641	628	624	614	601	588	588	602	660	# Ten least disturbed days											
Mean †	641	688	728	749	752	739	720	701	686	682	665	655	652	654	654	650	647	637	621	605	591	578	579	595	661	† Five international quiet days											
Mean ‡	608	631	695	698	735	730	745	735	738	731	776	750	703	687	726	660	696	673	681	652	648	624	619	597	689	‡ Five international disturbed days											
																										() Approximate											

APRIL 1952

TABLE 24
HOURLY VALUES OF HORIZONTAL INTENSITY
12500 plus tabular quantities expressed in gammas

G. M. T. used

Day	Hour																								Mean	24 Mean	Maximum	Minimum		Range
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23				h	m	
1	840	885	911	914	898	970	959	907	892	Continuous recording started 7th April, 1952										814	814	06	58	1009	11	27	150	859		
2	877	897	921	930	879	881	880	914	842	862	627	399	706	761	646	747	859	863	792	792	04	57	1208	1187						
3	845	952	013	087	092	081	853	952	880	645	549	740	644	827	646	674	760	744	832	832	07	58	1040	1187						
4	845	853	872	886	888	888	896	890	910	865	865	793	644	766	877	689	864	876	864	864	05	22	1230	882						
5	854	852	873	889	893	894	896	890	910	864	863	614	462	738	482	877	867	868	825	825	08	58	966	816						
6	865	867	893	918	915	898	896	890	910	875	835	860	870	876	879	881	878	877	825	825	09	44	974	816						
7	861	862	866	874	880	884	890	886	892	875	903	895	910	872	879	860	868	877	887	887	03	47	1136	286						
8	864	870	879	904	917	898	912	900	890	890	886	892	919	953	911	881	892	882	871	871	04	29	1006	363						
9	866	878	887	890	942	898	852	937	926	887	877	862	821	659	761	897	886	886	819	819	04	53	979	1158						
10	870	875	892	890	892	888	912	881	897	887	877	862	821	659	761	882	881	881	876	876	06	14	1301	748						
11	865	867	871	875	882	885	889	885	891	820	873	900	893	875	872	876	877	878	895	895	04	52	1155	748						
12	870	880	882	888	897	873	888	897	873	889	881	843	874	871	811	811	870	881	869	869	11	47	946	217						
13	857	861	868	881	891	926	916	892	883	857	869	865	863	877	878	745	684	854	798	798	03	27	978	122						
14	868	885	914	890	917	872	865	907	979	901	899	884	672	479	469	876	885	882	876	876	06	42	952	152						
15	856	872	875	871	883	903	910	898	908	864	745	772	872	868	867	777	523	604	784	784	06	16	1045	1144						
16	858	858	867	873	880	882	885	882	882	866	865	868	866	865	868	871	876	875	900	900	06	05	1217	764						
17	869	864	865	879	884	885	885	882	882	866	607	851	872	869	864	850	850	858	862	862	09	15	941	476						
18	858	854	864	864	877	887	885	882	890	876	876	877	794	724	852	877	880	882	860	860	17	42	1698	801						
19	861	858	860	869	885	882	889	891	890	881	887	884	882	888	887	884	881	870	872	872	19	47	888	150						
20	872	867	898	914	103	114	879	826	966	891	891	890	882	888	887	882	888	887	884	884	10	30	920	96						
21	855	920	867	922	852	826	964	837	402	901	856	591	510	377	365	388	431	489	787	787	12	20	913	87						
22	909	915	007	906	050	022	912	958	920	964	837	402	558	628	656	527	79	384	801	801	05	09	1199	1044						
23	862	877	891	911	950	949	941	906	900	765	394	457	554	724	684	788	681	804	819	819	04	54	1214	1495						
24	858	862	871	884	903	907	898	890	893	866	807	759	740	734	737	794	769	794	876	876	04	54	1214	1237						
25	862	859	868	876	886	895	899	893	889	866	807	759	740	734	737	794	769	794	846	846	DESIGNATIONS	675								
26	862	859	868	876	886	895	899	893	889	866	807	759	740	734	737	794	769	794	846	846	# Ten least days	357								
27	862	859	868	876	886	895	899	893	889	866	807	759	740	734	737	794	769	794	846	846	# Five international quiet days	357								
28	862	859	868	876	886	895	899	893	889	866	807	759	740	734	737	794	769	794	846	846	# Five international disturbed days	357								
29	862	859	868	876	886	895	899	893	889	866	807	759	740	734	737	794	769	794	846	846	() Approximate	357								
30	862	859	868	876	886	895	899	893	889	866	807	759	740	734	737	794	769	794	846	846		357								

TABLE 25

HOURLY VALUES OF HORIZONTAL INTENSITY

12500 plus tabular quantities expressed in gammas

MAY 1952

G. M. T. used

Day	Hour																								Mean	Minimum		Range				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		24	h		m	h	m	
1	979	932	918	987	934	937	828	823	832	543	462	475	666	559	743	798	779	815	784	868	881	876	878	796	787	03	38	11	54	008	1149	
2	943	958	956	950	922	944	893	910	844	(740	446)	634	288	484	525	564	762	833	794	799	856	843	854	938	802	802	04	56	15	18	332	909
3	922	958	990	950	922	966	908	972	922	778	650	760	823	775	660	452	585	656	689	675	660	692	841	927	827	804	04	28	11	48	221	1007
4	954	874	927	969	992	891	908	875	940	921	709	630	568	513	795	734	811	861	821	783	790	866	861	861	835	808	08	01	12	46	449	576
5	924	967	907	861	896	928	867	887	886	743	659	646	577	748	849	831	827	825	786	860	858	858	836	916	833	807	05	03	07	28	331	712
6	881	850	843	884	934	944	934	757	900	879	822	721	652	720	782	762	745	854	869	869	862	859	841	829	631	631	05	27	10	13	377	1456
7	832	871	888	903	961	946	971	851	914	364	739	637	627	320	154	71	64	23	339	544	621	832	843	871	829	829	02	40	12	18	560	580
8	866	900	983	893	878	894	907	825	723	828	839	709	686	751	756	661	777	846	861	867	867	872	863	851	864	864	01	08	00	58	832	43
9	848	852	855	870	864	871	864	866	870	866	864	861	862	870	868	873	876	879	871	874	874	873	859	848	868	868	03	04	08	43	815	88
10	(859	859	863	871	871	877	878	879	884	881	868	864	862	859	857	856	856	842	846	858	857	865	871	871	876	876	08	05	01	14	855	98
11	877	872	888	892	915	924	920	910	920	881	868	864	862	859	857	856	856	842	846	858	857	865	871	871	876	876	09	48	13	39	504	483
12	870	871	876	881	878	880	882	882	882	935	910	876	838	628	840	873	874	879	877	875	870	863	870	869	866	866	03	22	02	24	827	90
13	861	853	859	889	876	891	887	884	879	884	873	871	865	871	868	867	870	877	878	879	879	875	869	869	868	868	11	51	15	08	797	89
14	870	876	877	875	879	884	885	883	883	883	884	885	879	875	877	871	874	874	877	878	883	882	878	876	879	879	11	12	05	22	869	36
15	870	876	877	875	879	884	885	883	883	883	884	885	879	875	877	871	874	874	877	878	883	882	878	876	879	879	21	24	09	03	871	758
16	874	877	882	886	887	887	889	886	887	887	889	888	885	886	886	876	876	881	885	890	897	899	894	891	886	886	07	52	16	37	324	680
17	869	880	882	880	887	887	933	932	932	958	(837)	784	910	870	842	755	692	753	869	875	869	868	865	863	869	869	04	31	13	20	640	264
18	860	879	884	901	012	894	888	945	970	717	335	941	898	867	824	746	692	753	869	875	869	870	867	870	868	868	08	30	14	51	684	234
19	858	858	889	882	901	894	889	882	895	888	875	871	854	784	781	859	853	876	881	877	881	870	867	870	884	884	09	10	10	56	802	49
20	871	876	877	893	901	905	901	901	914	924	936	880	865	892	831	859	871	877	875	875	878	878	877	876	878	878	10	40	09	02	847	133
21	873	874	876	878	884	879	878	874	877	883	873	858	868	867	870	825	846	860	878	873	881	885	883	879	880	880	18	56	13	12	568	329
22	875	874	877	882	884	886	889	889	891	888	895	894	886	880	869	852	839	860	883	887	888	883	873	864	860	860	09	30	09	21	655	266
23	869	875	886	886	894	895	872	882	879	887	880	863	853	800	847	866	876	876	880	882	879	878	872	869	878	878	09	00	09	52	402	550
24	851	872	891	905	891	888	884	891	923	954	897	856	853	800	847	829	669	778	791	878	872	798	739	876	824	824	00	30	12	28	157	1071
25	866	867	874	877	886	888	888	886	905	790	864	850	818	588	698	829	704	842	835	739	737	792	872	865	777	777	00	30	12	28	157	1071
26	(105	062	118	993	879	883	871	825	823	835	767	355	309	325	505	602	704	842	825	834	872	870	862	866	793	793	09	16	09	16	235	1149
27	868	901	895	882	871	879	883	889	915	883	767	713	319	327	665	338	705	811	825	834	872	870	862	866	828	828	00	05	10	17	235	782
28	925	888	913	940	885	925	901	899	905	813	901	751	506	672	777	765	698	707	836	849	833	841	856	878	868	868	09	02	10	40	185	855
29	874	890	936	988	923	926	923	937	751	874	841	703	793	756	857	858	846	874	876	868	879	890	877	882	868	868	09	02	10	40	185	855
30	892	893	932	896	961	(985)	923	937	751	874	841	703	793	756	857	858	846	874	876	868	879	890	877	882	868	868	09	02	10	40	185	855
Mean	886	892	909	909	908	906	896	886	886	844	817	776	731	738	766	745	769	803	831	841	849	859	862	874	841	841	10	30	12	28	157	1071
Mean	866	866	872	879	882	886	885	883	884	885	880	874	864	845	864	861	868	869	874	876	878	878	875	872	874	874	10	30	12	28	157	1071
Mean	860	862	867	872	876	879	877	875	876	876	873	869	861	865	863	862	871	871	875	877	879	877	871	867	871	871	10	30	12	28	157	1071
Mean	950	966	997	984	954	955	910	877	865	710	629	570	504	514	489	458	583	627	694	708	748	808	857	896	761	761	10	30	12	28	157	1071

DESIGNATIONS
 # Ten least disturbed days
 / Five international quiet days
 * Five international disturbed days
 () Approximate

TABLE 26

HOURLY VALUES OF HORIZONTAL INTENSITY

JUNE 1952

12400 plus tabular quantities expressed in gammas

G.M.T. used

Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	Maximum	Minimum	Range			
1	975	966	959	974	989	985	981	982	981	901	975	956	953	945	956	957	960	969	971	973	974	966	968	966	970	05 06	10 23	13 18	934			
2	*	954	959	968	980	965	979	980	971	973	972	969	966	952	944	967	959	967	967	951	959	966	968	964	966	02 48	05 48	14 10	929			
3	*	966	964	966	968	981	981	976	969	967	968	963	967	968	968	958	956	944	950	963	969	966	974	964	966	(05 40)	05 40	18 00	934			
4	*	960	976	980	965	961	965	974	973	968	966	968	966	960	958	955	958	966	969	960	968	966	975	969	966	966	21 55	04 05	04 05	952		
5	*	967	967	968	975	971	980	989	984	986	982	962	994	832	804	788	770	972	977	979	979	977	967	964	966	07 47	07 47	04 25	630			
6	*	969	975	974	968	975	977	983	981	974	999	990	973	969	970	970	970	972	974	979	981	978	978	975	978	08 58	08 58	02 22	962			
7	*	975	969	971	968	976	984	983	977	976	979	974	961	961	974	977	979	974	977	979	981	979	987	986	985	976	22 57	01 52	01 52	930		
8	*	979	983	983	981	986	986	986	986	986	986	986	986	986	986	986	986	986	986	986	986	986	986	986	986	1007	08 55	12 96	11 07	706		
9	*	978	978	988	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	05 50	05 50	11 08	14 36	55	
10	*	967	969	981	981	989	992	978	974	989	900	994	985	979	944	763	888	957	975	976	974	962	945	952	962	962	06 39	06 39	14 55	887		
11	*	987	981	985	977	981	005	977	981	989	999	001	002	270	911	942	932	971	971	971	971	971	971	971	971	981	12 35	10 36	13 24	934		
12	*	968	968	974	975	985	988	990	994	989	986	988	996	009	955	966	973	972	976	981	982	983	982	985	982	981	03 34	03 34	18 18	964		
13	*	976	970	973	973	979	979	978	978	982	975	973	972	970	970	869	968	971	977	973	974	977	980	977	978	975	09 09	09 14	18 40	970		
14	*	979	972	973	973	980	979	991	991	982	975	970	978	769	940	821	828	843	797	738	886	976	971	937	974	973	09 09	09 14	10 24	766		
15	*	988	974	990	909	925	991	987	982	939	904	908	997	696	973	955	952	956	950	959	963	969	969	972	970	995	05 51	05 51	13 55	703		
16	*	968	968	980	987	998	986	976	992	942	959	947	885	918	810	890	826	876	945	976	980	983	981	982	982	970	05 51	05 51	14 56	559		
17	*	978	974	973	985	982	989	978	982	986	981	986	976	919	835	888	906	918	938	966	967	975	984	981	971	957	10 02	11 57	13 07	587		
18	*	962	947	969	946	001	976	975	974	974	981	982	007	008	898	920	924	966	961	971	972	976	979	969	969	970	12 03	11 23	13 30	846		
19	*	974	978	978	972	975	985	984	982	982	977	975	972	972	964	964	966	966	964	966	968	968	971	972	970	973	12 28	10 00	12 57	930		
20	*	968	968	968	972	975	977	979	976	975	974	972	971	970	958	968	966	966	968	968	970	970	972	979	972	971	12 27	09 94	03 05	942		
21	*	965	956	961	974	968	979	985	984	989	990	986	979	980	967	968	968	970	979	980	984	983	985	981	980	977	24 53	24 53	01 05	948		
22	*	982	973	972	972	977	984	984	989	919	987	983	975	916	830	814	833	733	815	881	881	983	(986)	984	982	08 20	(10 42)	16 38	582			
23	*	964	968	993	916	002	989	904	884	882	905	970	975	643	370	368	385	856	934	945	954	984	989	986	977	882	02 51	12 02	14 22	114		
24	*	993	021	108	017	967	993	959	973	004	013	970	765	840	660	733	873	914	944	943	961	983	997	993	996	940	23 11	10 42	13 40	465		
25	*	(974)	973	969	977	982	985	982	987	982	986	972	961	840	750	750	866	971	981	989	986	986	983	981	974	941	07 53	10 51	14 08	509		
26	*	980	984	986	987	988	991	987	983	007	934	778	759	937	796	750	830	851	920	928	971	983	981	969	969	961	06 56	11 00	15 46	773		
27	*	975	979	970	978	986	992	984	981	974	969	964	964	953	992	981	970	962	921	976	976	976	975	977	977	974	11 14	10 82	12 07	875		
28	*	969	976	968	974	975	978	981	979	974	976	974	964	953	992	981	970	962	978	979	975	974	952	948	979	969	23 45	10 08	21 30	901		
29	*	971	970	968	969	970	973	969	974	971	971	971	971	966	968	958	965	976	978	979	975	974	932	948	979	969	23 45	10 08	21 30	901		
30	*	010	047	011	143	930	820	793	818	709	643	673	806	684	605	668	770	890	936	943	950	957	957	958	958	862	03 33	12 31	(10 15)	285		
Mean		974	975	980	987	981	984	983	983	994	995	969	942	925	889	876	906	942	955	959	968	975	974	972	973	961	DESIGNATIONS			356		
Mean	*	968	970	972	973	974	980	982	980	981	978	976	972	971	966	966	968	968	971	974	972	974	978	977	975	974	* Ten least	disturbed			67	
Mean	†	971	968	969	973	975	980	981	980	984	982	976	970	970	966	969	969	971	974	975	977	977	980	980	979	975	† Five International	quiet days				
Mean	‡	990	004	020	032	973	959	942	958	972	984	951	850	724	618	618	868	886	907	900	939	979	973	964	971	913	‡ Five International	disturbed days				
																												() Approximate				

c Means of 4 values

TABLE 27

HOURLY VALUES OF HORIZONTAL INTENSITY

1200 plus tabular quantities expressed in Gammae

G. M. T. used

JULY 1952

Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	Maximum	Minimum	Range				
1	948	946	944	947	955	957	955	961	954	958	956	955	957	962	953	967	968	963	967	968	972	975	974	972	972	968	956	20 34	1038	21 36	879	159	
2	972	967	963	967	973	976	978	988	966	968	961	963	966	971	971	974	972	975	974	972	975	974	972	975	974	972	977	09 25	1093	23 50	966	127	
3	968	963	963	967	971	979	968	973	975	954	958	969	968	969	975	954	958	966	925	936	950	961	965	964	967	974	958	14 49	1004	16 59	859	145	
4	968	967	969	973	975	979	973	979	971	979	978	975	979	979	979	976	966	966	966	966	966	966	966	966	966	966	966	888	06 48	1285	(17 10)	-433	1718
5	970	965	968	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	07 40	1204	11 45	709	495
6	975	965	975	980	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	979	09 22	1011	(17 30)	858	153
7	952	954	965	965	963	975	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	13 35	1162	13 10	734	428
8	961	960	961	963	959	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	969	10 55	1204	09 53	699	505
9	971	970	968	978	993	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	978	07 39	1270	16 19	623	647
10	956	982	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	04 32	1254	15 24	925	329
11	969	959	948	966	969	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	10 22	1059	02 25	936	123
12	982	979	975	972	978	979	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	07 39	1270	16 19	623	647
13	978	974	971	986	984	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	983	07 39	1270	16 19	623	647
14	963	969	979	982	987	999	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	07 39	1270	16 19	623	647
15	967	971	967	970	978	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	987	07 39	1270	16 19	623	647
16	970	969	966	977	980	978	980	981	980	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	07 39	1270	16 19	623	647
17	978	974	974	978	976	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	981	07 39	1270	16 19	623	647
18	965	962	962	987	969	975	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	998	07 39	1270	16 19	623	647
19	970	976	982	987	977	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	07 39	1270	16 19	623	647
20	957	967	931	923	917	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	07 39	1270	16 19	623	647
21	929	939	977	995	988	990	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	999	07 39	1270	16 19	623	647
22	970	965	975	977	988	986	991	991	991	991	991	991	991	991	991	991	991	991	991	991	991	991	991	991	991	991	991	991	07 39	1270	16 19	623	647
23	959	981	987	992	990	983	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	984	07 39	1270	16 19	623	647
24	975	975	972	978	977	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	988	07 39	1270	16 19	623	647
25	960	974	900	926	976	984	960	971	976	971	963	954	910	834	928	955	964	965	965	965	965	965	965	965	965	965	965	965	07 39	1270	16 19	623	647
26	966	959	963	971	972	975	980	981	976	974	973	973	951	951	963	964	966	965	965	965	965	965	965	965	965	965	965	965	07 39	1270	16 19	623	647
27	977	968	953	956	971	979	981	980	978	980	978	980	977	972	972	972	972	972	972	972	972	972	972	972	972	972	972	972	07 39	1270	16 19	623	647
28	966	969	972	982	991	993	998	998	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	07 39	1270	16 19	623	647
29	969	966	962	968	972	979	981	987	990	994	981	967	968	966	954	958	964	960	964	964	964	964	964	964	964	964	964	964	07 39	1270	16 19	623	647
30	968	978	989	917	938	941	984	958	914	955	930	823	854	758	762	676	779	773	851	890	941	956	961	956	961	956	961	07 39	1270	16 19	623	647	
31	966	969	972	982	991	993	998	998	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	994	07 39	1270	16 19	623	647

Day	Mean	Designations
Mean	963	DESIGNATIONS
Mean # b	972	* Ten least disturbed days
Mean #	926	† Five international quiet days
Mean # c	926	‡ Five international disturbed days
		() Approximate

Insufficient data

b Means of 4 values

c Means of 8 values

TABLE 28
HOURLY VALUES OF HORIZONTAL INTENSITY

13000 plus tabular quantities expressed in gammas

AUGUST 1952

G. M. T. used

Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	Maximum h m	Minimum h m	Range		
1	344	343	348	352	371	384	389	400	376	366	383	444	398	339	338	338	341	347	345	337	339	345	344	340	360	12 00	5 09	01 01	330	179	
2	354	353	356	384	424	559	370	378	389	406	428	404	378	352	345	343	353	312	305	339	369	371	357	353	396	06 25	6 25	14 49	-61	754	
3	350	358	364	380	369	387	393	431	405	554	546	440	395	129	106	116	403	380	358	365	363	365	368	365	366	10 40	4 81	15 25	21 48	233	
4	337	345	366	381	390	389	379	393	406	442	415	379	355	349	343	350	351	355	340	332	351	358	359	360	363	09 44	5 01	16 35	1 89	312	
5	370	361	361	440	521	470	407	498	503	543	415	377	368	370	369	350	253	264	339	377	383	361	371	365	383	04 48	5 17	13 55	15 1	166	
6	353	349	365	399	387	395	387	426	426	402	422	412	353	371	340	334	355	356	349	357	362	385	384	373	365	377	08 15	5 61	12 36	25 1	336
7	368	372	358	375	401	400	392	387	423	417	393	349	212	250	364	376	376	378	378	377	368	377	376	373	368	368	09 09	4 54	12 18	88	366
8	366	364	362	361	368	371	374	375	376	376	370	370	358	351	354	360	366	360	334	349	372	377	367	359	364	08 45	3 80	19 08	308	604	
9	353	389	403	398	390	400	399	400	398	465	455	320	78	38	232	188	221	300	337	352	372	375	373	369	334	09 55	4 96	13 10	-108	72	
10	374	379	381	398	401	387	390	379	390	428	493	451	396	378	373	380	379	375	383	387	389	395	385	372	393	10 45	6 06	13 30	359	247	
11	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
12	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
13	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
14	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
15	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
16	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
17	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
18	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
19	369	391	380	386	391	397	393	409	439	441	455	402	344	365	361	315	270	380	367	362	357	367	372	366	378	10 35	5 16	15 52	126	390	
20	353	356	363	376	416	366	367	368	383	359	352	363	359	342	346	232	242	315	372	374	372	371	366	355	350	09 35	5 32	15 50	129	599	
21	348	360	361	375	387	390	389	385	385	435	235	122	238	249	340	363	371	375	356	364	379	378	353	349	378	09 35	4 05	00 45	-67	63	
22	360	364	369	373	373	377	386	385	381	383	370	368	380	377	377	376	378	381	379	379	386	381	373	367	375	06 57	4 06	12 25	342	46	
23	363	364	374	373	371	380	387	390	382	383	377	374	373	373	373	374	375	375	374	385	382	384	379	369	368	376	02 23	4 28	01 50	334	94
24	350	355	357	355	357	370	374	373	385	394	379	373	370	365	364	366	370	371	370	371	367	368	364	360	368	08 54	4 31	00 27	348	83	
25	355	355	359	358	365	372	372	372	373	375	375	366	361	368	369	370	372	374	376	378	380	377	376	374	370	06 05	3 76	12 41	349	27	
26	371	368	369	371	371	379	384	385	379	381	381	376	373	378	381	381	383	385	385	385	385	385	382	378	386	10 52	3 93	23 45	283	30	
27	364	368	368	357	366	387	403	466	444	482	468	395	373	378	381	381	383	385	385	385	385	382	378	367	378	07 25	5 57	16 15	283	274	
28	370	363	368	379	378	392	390	374	374	375	368	367	364	365	365	352	313	335	367	374	381	374	371	363	372	05 56	4 03	23 55	358	45	
29	355	355	353	359	362	367	377	378	379	377	375	374	374	367	286	177	247	317	333	355	349	307	306	325	340	09 08	3 84	15 50	15	369	
30	364	364	431	575	635	631	499	448	378	373	364	352	355	361	358	349	334	306	355	347	339	343	366	365	400	05 48	6 97	17 40	279	118	
31	353	354	366	374	388	366	391	413	432	428	295	200	245	332	353	355	355	356	357	350	347	343	334	319	350	09 00	5 02	11 20	112	390	
Mean	358	362	369	386	399	405	405	413	407	418	395	361	337	326	336	327	318	355	361	365	369	369	364	360	371	371	10 35	5 16	15 52	126	390

DESIGNATIONS
 * Ten least disturbed days
 † Five international quiet days
 ‡ Five international disturbed days
 () Approximate

TABLE 29
HOURLY VALUES OF HORIZONTAL INTENSITY

12700 plus tabular quantities expressed in gammas

SEPTEMBER 1952

G. M. T. used

Day	12700 plus tabular quantities expressed in gammas																								Range								
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	Maximum	Minimum					
1	646	683	723	779	858	792	909	705	730	604	689	296	490	312	303	534	581	633	667	657	618	644	629	596	628	06	52	1075	11	36	-176	1251	
2	679	682	713	730	795	876	868	822	697	547	665	608	466	484	641	654	568	547	642	669	653	652	647	644	640	663	05	27	1030	14	19	402	628
3	678	670	705	658	669	682	683	682	673	687	646	477	635	484	674	635	648	674	668	664	673	672	668	662	662	636	10	13	712	14	19	368	344
4	681	690	671	675	676	699	705	699	701	701	704	549	472	228	376	344	403	383	555	657	669	646	645	652	652	564	10	20	740	16	57	-112	852
5	668	676	677	675	676	699	705	699	701	701	704	549	472	228	376	344	403	383	555	657	669	646	645	652	652	564	10	20	740	16	57	-112	852
6	682	685	689	708	719	805	772	836	874	674	649	648	626	624	299	565	635	621	690	649	654	659	661	660	660	681	08	04	940	15	11	500	440
7	659	657	658	695	762	758	730	722	703	674	663	658	653	649	653	653	650	606	583	590	629	652	661	647	648	653	04	44	797	18	05	407	390
8	673	718	734	702	875	841	834	640	596	646	681	471	146	310	400	009	233	438	583	658	637	645	659	643	643	656	04	29	1057	15	47	-220	1277
9	670	720	798	873	832	900	817	617	678	683	79	524	583	486	532	340	497	658	664	658	629	645	659	643	643	656	05	40	1090	10	23	-431	1521
10	662	660	701	740	668	736	719	744	651	708	590	512	619	533	615	660	667	664	655	656	669	669	661	657	657	648	10	36	927	10	49	305	400
11	656	663	661	670	670	687	679	672	682	708	697	639	646	598	440	490	629	652	672	678	680	657	656	659	659	664	04	58	935	12	52	214	721
12	661	662	694	758	829	792	705	682	769	741	681	607	572	472	621	669	658	669	622	663	657	658	658	649	649	664	04	54	888	11	36	609	79
13	656	658	659	661	673	674	675	673	676	679	665	639	633	636	669	674	674	680	681	683	683	681	670	669	669	668	04	34	888	15	42	-90	1013
14	661	664	700	713	842	755	745	715	703	667	652	565	522	456	273	232	441	656	681	675	656	650	654	648	648	623	04	32	923	15	42	-90	1013
15	654	664	665	671	672	672	671	676	668	671	676	668	673	680	686	656	660	667	672	671	643	664	650	635	635	655	09	44	693	15	22	496	197
16	657	665	675	667	681	673	673	680	686	673	655	646	622	619	646	656	660	667	672	671	643	664	626	645	645	659	04	48	712	12	12	584	128
17	652	653	653	667	680	671	671	677	673	672	678	636	572	630	634	668	671	673	684	684	679	675	667	655	655	661	10	49	707	12	50	537	170
18	654	659	661	671	693	694	697	680	676	676	672	672	678	678	679	678	679	681	682	677	681	677	669	657	657	666	06	12	722	23	46	656	66
19	648	650	656	663	667	672	672	674	671	670	670	670	671	672	674	674	674	680	683	685	683	673	664	657	657	669	06	06	684	00	37	645	39
20	645	657	709	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	02	21	744	01	09	619	125
21	645	657	709	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	02	21	744	01	09	619	125
22	645	657	709	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	648	02	21	744	01	09	619	125
23	652	656	662	675	697	688	691	689	689	674	609	666	663	663	662	645	643	654	667	669	667	658	654	653	653	677	04	26	700	15	48	651	49
24	667	677	679	687	700	729	746	704	682	678	677	685	675	666	642	511	537	663	672	673	676	666	653	635	635	666	06	13	765	16	29	448	317
25	654	662	669	675	676	676	675	675	676	677	675	666	673	671	668	668	674	669	667	658	666	669	649	612	612	667	05	55	688	23	56	592	96
26	591	744	875	927	957	895	766	666	680	648	675	599	577	617	624	642	648	662	663	662	663	657	651	640	640	693	04	25	1009	12	24	552	457
27	642	642	653	678	765	880	894	866	518	560	601	469	586	566	414	373	543	654	666	659	662	657	655	648	648	635	05	46	925	08	45	-06	931
28	648	661	690	691	810	837	864	863	757	404	666	648	596	536	540	670	515	502	361	360	515	577	645	667	667	631	06	59	949	09	29	-10	959
29	746	721	703	655	663	816	826	794	758	443	495	273	108	-44	576	675	656	664	663	638	543	482	576	610	610	585	06	58	883	13	01	-765	1648
30	884	796	678	739	724	670	670	761	707	630	294	581	517	500	566	486	459	613	636	652	653	653	650	642	642	632	00	48	993	10	23	-35	1028
Mean	669	676	691	705	735	747	740	713	690	644	621	585	549	536	568	560	589	633	642	652	653	650	651	642	642	648	* Ten least	DESIGNATIONS				565	
Mean	* a	651	657	662	667	679	680	682	681	676	677	666	638	632	641	653	666	676	678	676	675	667	660	653	653	664	* days	disturbed				121	
Mean	†	652	655	658	667	682	680	681	679	677	679	674	658	645	657	665	670	675	680	683	682	681	676	668	660	670	† Five international	quiet days					
Mean	‡	738	728	727	750	790	804	811	703	694	581	448	429	369	313	475	409	485	601	643	647	616	615	635	628	610	‡ Five international	disturbed days					
	a	Means of 9 values																										()	Approximate				

TABLE 30

HOURLY VALUES OF HORIZONTAL INTENSITY

12600 plus tabular quantities expressed in Gammas

OCTOBER 1952

G. M. T. used

Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	Maximum	Minimum	Range		
1	736	741	760	758	803	782	772	784	789	715	725	741	754	755	743	731	728	752	742	741	748	752	751	743	752	751	831	09 50	563	268	
2	744	749	744	754	787	824	788	765	779	758	762	727	703	553	675	753	768	762	753	723	705	691	751	750	743	852	05 44	852	13 09	440	
3	755	765	768	788	891	897	870	785	759	786	762	760	635	551	438	727	429	718	551	717	660	631	663	720	690	40 40	919	15 25	285	634	
4	778	838	755	795	943	969	917	915	813	608	862	786	768	676	363	224	588	712	697	651	736	748	695	751	733	07 08	1131	09 15	050	1081	
5	743	763	776	820	960	955	936	909	464	592	492	452	323	666	691	397	188	554	184	715	768	769	766	766	666	06 06	1153	16 06	-143	1296	
6	786	787	845	884	836	980	927	901	784	567	740	735	526	473	557	445	696	736	769	788	777	771	770	766	748	05 31	1081	12 59	198	883	
7	(764)	762	763	771	786	796	771	786	776	768	722	619	548	620	574	707	763	755	769	769	763	750	749	752	738	07 04	871	14 49	369	502	
8	756	758	777	785	792	811	(779)	781	776	778	705	603	539	590	743	764	774	774	777	774	769	752	763	751	766	06 00	826	12 55	339	204	
9	751	765	770	782	794	843	808	844	818	677	717	778	633	666	770	765	767	774	782	747	658	721	751	752	766	07 59	917	18 14	436	481	
10	740	777	862	920	958	006	867	806	798	796	721	737	714	579	757	756	752	770	776	773	764	760	760	749	787	05 58	1084	15 11	416	668	
11	739	760	774	783	783	784	782	781	776	771	769	763	762	759	757	728	743	767	765	769	765	755	751	(735)	763	04 07	799	00 09	719	080	
12	747	751	767	772	773	774	769	771	772	770	768	766	768	769	769	769	762	761	743	758	770	762	756	745	765	05 38	878	17 03	704	174	
13	744	755	766	772	773	774	784	784	781	781	779	766	726	755	767	767	773	771	771	769	759	745	730	737	767	05 45	784	18 31	723	061	
14	753	764	775	798	846	828	834	799	811	802	787	744	659	767	773	761	730	604	663	728	753	758	751	748	758	04 30	869	12 41	674	139	
15	740	758	770	807	846	828	834	799	811	802	787	744	659	767	773	761	730	604	663	728	753	758	751	748	758	04 30	869	12 41	674	139	
16	748	763	793	838	853	818	833	852	713	776	814	765	722	670	745	676	678	720	762	760	757	759	753	745	762	08 02	925	17 25	475	394	
17	744	752	766	774	785	786	793	811	818	640	697	761	727	747	745	723	759	770	768	766	762	754	745	743	756	08 58	894	09 12	571	357	
18	742	757	773	789	807	794	796	786	798	806	782	636	699	713	620	665	717	768	780	776	768	757	748	735	750	09 52	833	14 51	569	323	
19	731	740	750	760	777	778	777	772	778	779	769	590	628	630	620	479	665	709	661	737	714	756	762	758	706	10 47	796	14 43	299	264	
20	758	765	780	779	778	791	783	780	775	771	768	765	714	665	768	769	772	774	778	776	771	776	757	758	769	05 16	846	12 14	632	497	
21	755	760	761	765	783	785	788	789	793	788	784	777	674	725	770	759	765	776	777	780	777	775	774	773	769	05 28	797	12 28	540	214	
22	770	768	766	765	773	779	781	786	784	784	777	775	774	770	771	775	778	776	779	781	775	774	773	770	775	07 18	790	02 04	796	257	
23	768	765	774	784	795	802	810	816	818	824	835	748	782	708	723	775	778	778	779	781	775	774	773	770	775	07 18	790	02 04	796	257	
24	767	793	865	839	959	850	862	905	829	801	715	591	392	455	076	287	404	566	815	782	755	756	762	763	700	02 34	1217	14 44	-376	1593	
25	785	802	781	829	780	777	782	807	871	810	796	724	760	752	762	763	759	758	757	749	753	753	751	743	775	08 28	919	11 20	636	283	
26	748	791	790	777	799	828	817	789	800	779	754	691	680	712	742	773	759	759	774	770	764	765	759	759	766	05 32	848	11 40	643	205	
27	757	765	768	761	767	785	781	792	794	781	742	744	702	715	535	315	437	575	693	697	681	718	738	747	700	08 15	808	12 27	230	578	
28	752	805	920	837	729	796	770	783	797	844	796	739	749	759	534	281	157	450	667	644	688	712	717	779	721	04 13	1215	16 15	-215	1430	
29	783	811	004	952	875	869	972	914	851	802	733	468	190	218	331	209	432	668	781	775	772	748	754	779	695	02 46	1215	13 36	-204	1419	
30	755	770	799	808	834	831	823	814	782	758	754	712	664	675	646	622	656	701	728	750	748	752	748	751	745	745	DESIGNATIONS	517			
31	754	763	771	782	785	789	789	786	792	768	768	749	737	752	749	748	755	767	769	769	767	760	754	749	766	10	least	days	disturbed	183	
Mean	754	761	769	774	783	785	783	782	784	784	776	744	726	748	740	747	759	771	771	774	772	767	761	757	766	10	least	days	disturbed	183	
Mean	765	802	904	899	973	888	891	885	751	729	720	607	484	555	399	280	354	590	689	719	744	747	739	768	703	10	least	days	disturbed	183	
Mean	765	802	904	899	973	888	891	885	751	729	720	607	484	555	399	280	354	590	689	719	744	747	739	768	703	10	least	days	disturbed	183	
Mean	765	802	904	899	973	888	891	885	751	729	720	607	484	555	399	280	354	590	689	719	744	747	739	768	703	10	least	days	disturbed	183	
Mean	765	802	904	899	973	888	891	885	751	729	720	607	484	555	399	280	354	590	689	719	744	747	739	768	703	10	least	days	disturbed	183	

() Approximate

* Ten days

† Five international quiet days

‡ Five international disturbed days

TABLE 31

HOURLY VALUES OF HORIZONTAL INTENSITY

12500 plus tabular quantities expressed in gammae

G. M. T. used

NOVEMBER 1952

Day	Hour																								24 Mean	Maximum	Minimum	Range		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23						
1	923	946	913	912	920	909	920	896	884	883	808	720	664	674	399	577	720	849	794	813	852	852	834	845	813	01 51	983	14 37	181	802
2	868	873	881	895	925	949	899	918	890	882	870	712	793	817	563	723	775	856	884	879	874	876	873	863	848	04 44	984	14 19	432	582
3	857	867	874	881	891	904	925	907	898	908	805	780	784	806	779	802	882	890	888	877	868	866	853	851	862	09 45	999	00 00	696	303
4	851	857	858	872	872	876	874	884	879	880	867	861	864	852	781	852	866	867	885	862	877	873	859	857	874	06 41	927	14 22	847	80
5	857	860	879	929	902	945	955	933	925	844	761	668	377	646	958	886	881	891	871	866	872	868	852	853	848	07 36	891	12 53	749	142
6	855	852	865	893	904	906	928	906	897	896	884	810	836	854	863	806	842	892	802	744	815	839	824	862	856	07 17	1073	12 53	231	842
7	872	875	879	895	927	981	948	926	904	876	805	833	863	826	802	846	868	858	859	845	844	859	864	850	871	06 32	945	19 07	699	246
8	866	865																								05 51	1033	14 07	728	305
9	869	877	890	903	916	910	910	904	906	903	901	898	893	893	892	891	884	879	881	881	880	876	874	866	891	04 02	917	00 46	867	50
10	872	879	887	892	897	905	904	893	894	895	896	891	888	888	887	883	887	861	873	877	874	871	866	866	881	06 02	913	16 16	846	67
11	856	864	875	887	898	902	912	899	882	881	876	874	873	876	880	882	881	882	883	882	876	871	859	856	880	06 12	918	00 38	851	67
12	853	854	874	885	891	893	888	883	881	876	878	877	876	882	884	885	886	889	889	885	881	872	867	862	879	05 09	897	00 21	848	149
13	861	875	882	895	904	904	926	916	923	909	874	885	887	884	882	875	877	879	880	870	864	856	854	852	884	08 46	945	21 14	850	93
14	853	859	866	882	891	914	937	966	879	936	875	843	846	859	860	843	843	867	861	836	844	857	856	853	876	08 59	1042	15 53	818	224
15	859	865	873	885	896	945	975	985	940	899	888	834	457	567	373	729	896	900	885	878	863	855	844	837	830	07 30	1045	12 43	157	888
16	847	860	870	877	884	889	885	925	869	780	795	714	834	834	848	869	890	893	885	803	756	824	853	843	847	08 05	984	00 42	615	369
17	854	883	887	892	894	919	903	921	965	994	917	896	875	855	869	871	874	884	885	883	870	877	859	865	891	09 11	1016	00 44	830	186
18	848	857	881	897	905	915	912	902	893	893	883	884	886	885	882	881	884	889	887	884	874	861	855	858	866	05 51	903	11 11	815	88
19	849	857	881	897	905	915	910	911	925	904	898	898	894	894	894	894	894	894	894	894	894	894	894	894	866	05 19	917	22 34	849	68
20	860	872	891	904	898	917	910	911	925	904	898	898	894	894	894	894	894	894	894	894	894	894	894	894	866	07 42	1175	08 21	510	665
21	860	866	879	899	885	895	913	922	888	858	730	567	532	495	512	574	708	805	847	878	876	860	853	852	847	07 19	929	12 01	245	684
22	858	875	887	894	911	925	994	957	936	966	901	871	786	781	828	864	857	857	870	872	873	868	864	857	884	06 08	1031	13 10	699	332
23	868	871	883	896	867	867	874	901	941	893	868	864	850	759	728	778	837	857	870	870	870	859	862	862	852	08 59	1037	12 47	602	435
24	858	854	878	876	877	875	877	883	900	919	858	864	814	758	772	788	839	867	868	870	863	859	862	862	855	09 41	942	14 18	701	241
25	858	866	878	879	897	901	953	929	954	949	905	849	814	417	570	711	639	772	830	711	697	740	753	833	828	09 51	1136	19 52	542	594
26	875	878	880	949	952	905	131	680	940	871	691	683	498	387	650	738	695	830	856	834	826	832	854	861	884	06 59	1215	13 53	297	1512
27	894	890	939	957	905	938	952	952	903	871	691	683	498	387	650	738	695	830	856	834	826	832	854	861	884	03 01	1037	12 58	163	874
28	844	856	863	873	877	887	880	895	930	831	861	730	665	529	732	807	871	862	815	850	874	867	862	863	830	09 26	1063	13 08	359	704
29	857	852	867	878	891	922	951	945	895	867	869	790	796	827	822	842	829	847	875	862	852	847	845	847	862	06 57	999	11 37	709	290
30																										04 02	917	00 46	867	50
Mean	862	870	881	893	899	915	929	930	907	882	840	798	759	747	768	810	828	860	862	853	853	855	851	854	854	DESIGNATIONS				405
Mean	857	867	877	888	896	901	904	899	899	898	881	878	876	871	869	875	874	880	882	880	873	866	858	858	879	†	†	†	†	89
Mean	861	868	880	890	900	901	906	897	889	885	883	881	879	881	882	882	875	878	882	880	876	869	861	857	881	†	†	†	†	†
Mean	882	891	905	920	914	940	993	980	883	858	754	697	616	524	650	719	692	802	819	803	813	826	825	847	815	†	†	†	†	†
																										†	†	†	†	†

() Approximate

† Five international quiet days

‡ Ten least disturbed days

TABLE 32

HOURLY VALUES OF HORIZONTAL INTENSITY

DECEMBER 1952

12600 plus tabular quantities expressed in gammas

G. M. T. used

Day	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	Mean	Maximum	Minimum	Range						
1	745	763	786	794	803	816	807	778	823	823	729	767	773	782	776	506	579	750	619	699	758	732	725	727	743	741	08	56	868	14	45	294	574		
2	727	765	782	823	806	832	818	813	804	818	814	699	693	624	243	254	94	538	746	779	735	749	760	707	757	682	05	31	848	15	32	-107	955		
3	760	772	782	821	898	938	894	894	821	877	818	745	731	702	612	526	688	772	776	777	766	753	753	749	754	769	05	10	1043	14	48	426	617		
4	751	802	854	848	830	842	821	804	827	894	808	394	450	481	341	548	713	619	553	666	718	740	766	761	754	673	06	53	939	11	21	416	523		
5	766	749	818	807	813	844	815	819	801	815	789	784	800	508	682	765	770	767	766	780	788	787	775	766	761	758	09	09	928	12	40	350	578		
6	763	773	779	786	820	828	815	819	801	815	789	784	800	774	769	751	735	735	756	780	788	787	767	772	755	779	04	45	830	15	11	684	146		
7	761	755	753	776	801	800	804	836	825	811	789	778	771	767	757	756	749	756	760	767	772	780	778	770	770	778	07	09	859	15	56	730	129		
8	765	765	773	775	795	797	810	812	820	810	788	778	775	775	775	719	688	764	771	775	777	776	773	771	763	774	08	41	830	15	01	628	202		
9	767	761	769	774	778	789	790	788	788	782	782	776	771	772	775	774	775	776	775	763	763	760	754	746	743	772	05	37	794	23	39	743	051		
10	750	752	769	782	782	788	786	781	774	776	771	756	692	686	688	603	585	628	708	727	749	754	746	742	743	732	05	00	800	16	11	492	308		
11	736	747	772	779	844	912	826	841	843	843	765	730	595	529	724	762	750	742	730	741	756	758	755	754	754	764	764	06	04	985	13	04	414	571	
12	750	759	772	772	789	807	801	827	853	821	773	770	608	459	459	551	767	790	774	767	758	755	747	746	746	736	09	04	880	14	56	346	531		
13	747	743	760	842	919	862	848	813	892	818	813	892	595	693	770	802	775	759	759	756	756	755	754	750	750	788	05	21	1220	12	32	392	828		
14	756	757	769	774	782	794	784	781	770	770	763	759	774	774	775	770	748	760	769	773	768	764	753	754	754	761	05	30	804	14	16	627	177		
15	759	753	774	823	822	830	842	847	873	793	643	733	779	783	779	783	782	779	786	782	772	784	780	763	750	782	09	15	914	10	36	504	410		
16	744	753	772	793	808	839	836	834	822	793	726	433	565	610	592	628	628	790	784	780	763	735	736	740	740	729	05	50	860	11	43	266	594		
17	743	748	785	815	890	956	984	905	839	777	757	738	770	760	765	768	772	785	787	780	771	762	727	750	750	796	06	16	1095	22	53	706	389		
18	756	766	798	816	844	813	804	798	798	804	798	782	778	776	717	744	776	761	698	704	758	770	742	731	731	770	24	00	855	18	39	660	195		
19	744	759	777	796	812	804	795	790	781	780	782	777	778	774	775	775	777	776	774	774	767	774	767	759	751	776	24	00	820	00	01	731	89		
20	745	747	757	772	788	707	794	787	790	784	771	761	739	724	757	758	764	766	771	771	767	767	763	764	754	762	05	47	803	13	16	704	99		
21	744	751	761	766	780	791	800	805	804	798	788	774	764	753	724	749	764	767	767	763	764	764	765	764	754	769	07	05	803	14	17	708	95		
22	756	755	756	764	772	786	795	786	794	789	719	748	755	698	540	431	488	653	731	769	766	764	755	759	759	722	09	30	831	14	10	324	107		
23	762	767	770	777	800	810	810	812	802	826	638	610	660	252	363	498	682	743	778	773	777	776	780	775	770	776	10	18	810	11	30	752	58		
24	767	768	788	817	800	810	810	812	802	810	812	802	660	252	363	498	682	743	778	773	777	776	780	775	770	776	10	18	810	11	30	752	58		
25	757	777	809	882	896	804	778	787	817	817	787	692	522	499	618	707	742	761	756	740	753	763	765	773	763	739	04	01	976	13	37	545	225		
26	775	774	775	778	762	804	827	815	777	771	773	787	713	733	749	728	708	743	758	768	764	760	759	755	755	765	11	52	920	16	03	676	829		
27	755	767	768	778	802	800	830	817	792	784	782	707	708	757	772	771	773	770	765	733	737	737	670	723	723	762	06	29	850	22	35	568	244		
28	779	778	773	777	787	790	786	782	789	789	783	754	733	744	542	580	669	619	683	740	745	736	709	694	732	00	48	814	14	36	347	467			
29	729	767	822	855	817	809	801	802	843	692	620	674	621	680	666	376	156	34	342	581	696	746	746	722	658	02	38	907	17	19	-199	1106			
30	745	783	803	854	890	982	917	869	833	729	570	510	478	431	311	380	135	616	761	765	764	746	750	753	682	05	39	1164	16	27	-185	1349			
31	760	787	818	810	825	809	891	895	821	799	720	639	700	753	610	347	703	760	744	740	729	734	736	731	741	07	01	957	15	10	989	32			
Mean	754	762	782	801	817	834	834	824	814	783	734	705	685	660	638	641	687	715	738	749	755	756	747	748	748	748	748	DESIGNATIONS			421				
Mean #	756	759	766	776	791	797	797	798	795	788	775	769	767	753	725	718	735	756	768	771	770	767	762	756	756	756	767	Ten least disturbed days			145				
Mean /	752	757	767	777	788	793	792	790	789	787	784	770	765	760	761	765	770	771	772	769	767	765	759	752	752	752	772	Five international quiet days							
Mean #	740	772	804	844	852	905	896	878	839	750	656	579	554	506	468	440	463	555	639	700	737	751	745	749	749	749	701	Five international disturbed days							
																												() Approximate							

TABLE 33

HOURLY VALUES OF VERTICAL INTENSITY

64000 plus tabular quantities expressed in gammas

G.M.T. used

APRIL 1952

Day	24 Mean																								24		Range				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23	24	h		m			
1	609	619	623	615	597	635	581	531	555	556	408	345	543	556	532	594	559	432	490	543	542	551	571	573	548	05	17	677	11	06	515
2	612	624	596	613	586	588	582	501	492	448	448	469	458	465	438	530	534	515	448	511	471	520	554	570	531	04	50	736	10	08	612
3	609	635	621	638	667	638	609	608	584	581	574	478	296	465	561	555	426	435	498	555	562	559	563	581	545	00	49	681	12	21	478
4	574	581	596	600	596	585	584	592	598	547	575	477	438	438	556	565	577	573	567	569	570	563	565	571	561	05	21	724	11	46	374
5	574	582	596	664	642	570	621	619	575	565	544	575	570	555	561	567	567	567	565	562	562	563	567	570	576	09	40	627	12	49	324
6	574	581	579	584	579	574	571	567	570	577	539	546	546	555	544	513	463	538	569	570	561	561	567	570	558	09	32	613	13	01	178
7	573	574	582	596	601	600	597	588	582	586	508	431	501	502	523	477	573	617	601	588	584	573	573	573	563	17	02	667	12	57	479
8	574	584	586	644	629	659	642	629	633	597	577	546	509	530	615	481	528	565	569	562	562	562	563	570	578	06	11	783	15	22	364
9	571	574	586	644	693	586	569	579	552	486	559	593	586	571	569	569	569	569	569	569	569	569	569	569	577	04	22	737	09	00	408
10	571	574	578	582	584	584	585	582	579	573	571	582	544	555	527	558	546	485	462	509	535	546	559	573	556	11	48	617	18	25	182
11	582	578	582	613	623	615	616	610	579	584	555	530	451	368	138	424	584	562	543	471	536	530	534	573	533	00	35	669	14	47	006
12	582	578	582	586	609	633	613	578	582	542	554	547	555	542	527	548	556	554	548	556	554	552	551	551	566	05	07	659	09	10	474
13	597	600	610	597	600	610	640	650	638	621	608	575	462	648	880	889	858	709	597	562	455	556	600	606	635	14	29	1074	20	28	714
14	575	577	575	584	588	597	569	570	570	555	574	532	592	596	584	539	543	544	555	561	570	577	574	575	564	07	15	640	10	04	277
15	581	577	578	579	574	571	570	569	570	570	574	572	573	571	569	482	389	497	554	559	570	556	547	578	555	00	06	588	11	54	327
16	569	570	573	571	569	566	561	559	562	574	577	558	558	556	546	559	551	556	559	561	565	565	566	569	564	00	06	601	19	36	490
17	554	556	569	571	573	570	569	566	562	561	561	567	567	562	561	556	558	546	556	555	555	555	554	551	552	12	20	592	23	58	540
18	615	636	612	628	694	654	628	417	569	584	554	484	471	459	492	561	597	555	597	632	615	596	581	581	552	16	18	763	13	46	129
19	654	639	671	596	678	636	596	532	450	397	405	570	758	728	624	589	594	608	570	586	578	613	593	660	597	12	43	905	10	46	247
Mean	585	592	596	580	618	606	588	562	562	549	524	513	516	532	545	559	553	544	546	552	554	562	565	602	563	DESIGNATIONS			294		
Mean *	573	575	581	589	595	586	583	580	574	555	547	551	543	554	558	546	532	547	557	555	559	559	559	564	564	# Ten least disturbed days			216		
Mean †	572	573	580	582	584	588	587	578	570	563	562	556	545	558	560	559	555	550	551	548	551	552	554	556	564	† Five international quiet days					
Mean ‡																										# Five international disturbed days					
																										() Approximate					

Continuous recording started on 7th April, 1952

Insufficient data

TABLE 34

HOURLY VALUES OF VERTICAL INTENSITY

64000 plus tabular quantities expressed in gammas

G.M.T. used

MAY 1952

Day	Hour																								Mean	24	Range				
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23							
1	633	631	663	642	611	582	438	422	492	542	578	582	575	638	597	521	574	596	555	592	605	602	623	578	03	38	760	07	42	149	611
2	663	665	666	586	586	620	582	451	408	542	578	582	550	692	611	613	584	551	559	573	581	586	638	586	02	50	752	17	18	166	586
3	640	660	666	624	616	552	594	585	525	423	492	557	561	519	345	327	342	392	486	493	511	624	671	524	11	58	800	12	33	315	485
4	666	613	635	642	627	600	625	581	624	596	665	606	409	463	532	465	582	601	559	559	592	609	624	577	01	05	739	10	15	318	421
5	651	669	593	596	615	642	605	600	542	594	467	534	590	604	581	548	543	557	611	600	586	581	578	582	04	41	731	07	27	134	597
6	611	605	601	616	663	662	492	381	424	504	528	540	528	552	611	478	409	168	237	385	480	600	648	515	10	01	854	07	50	-185	1039
7	608	627	617	611	605	613	624	519	517	584	597	511	493	509	503	455	504	542	570	570	570	584	584	564	02	39	739	07	59	353	386
8	600	615	656	617	605	613	588	586	586	584	578	573	570	562	561	566	569	570	570	570	570	570	566	577	02	46	597	13	42	552	45
9	570	582	584	581	573	573	571	570	573	577	581	567	525	534	554	559	563	563	561	561	563	565	563	566	03	04	608	12	44	490	118
10	570	571	570	569	565	565	563	562	565	563	562	565	558	559	559	556	555	543	540	547	554	561	573	574	06	02	640	18	22	532	108
11	573	575	588	586	598	612	606	597	602	582	567	598	558	559	555	555	546	544	544	547	551	552	555	574	09	48	659	13	20	277	382
12	575	577	578	577	573	569	567	570	572	612	608	574	532	424	546	557	558	559	557	557	557	557	558	568	03	18	624	12	18	543	81
13	570	581	596	597	582	586	594	573	567	570	567	565	546	557	558	561	563	565	561	559	557	557	558	564	03	49	582	15	10	470	112
14	567	570	571	574	574	570	569	561	569	558	558	558	516	528	501	500	543	546	561	559	558	557	557	557	04	50	577	11	59	538	39
15	562	567	570	570	573	573	569	566	562	561	559	557	557	558	559	558	559	559	557	557	559	557	547	544	06	26	578	18	01	538	40
16	557	559	561	563	567	570	573	573	569	565	562	562	559	558	550	544	544	550	546	555	561	566	547	544	06	50	647	(10	50)	158	489
17	543	559	561	574	570	577	606	567	551	546	368	401	551	555	541	500	541	503	546	555	561	566	570	561	06	26	744	09	37	138	606
18	559	570	582	586	654	570	582	620	586	278	543	570	565	543	488	480	505	570	589	586	586	582	570	569	08	27	642	12	14	393	249
19	558	565	585	582	590	581	585	585	597	594	582	570	515	439	503	527	539	575	582	574	571	566	567	561	08	27	642	12	14	393	249
20	557	558	563	570	574	594	601	597	598	585	624	574	492	547	498	528	552	561	562	561	570	567	567	562	08	27	642	12	49	435	207
21	561	561	559	558	562	566	567	567	570	569	555	543	555	552	498	548	554	557	559	565	566	567	567	566	08	17	578	11	05	525	53
22	562	563	562	559	559	561	559	559	562	567	579	579	555	558	544	485	496	513	540	548	559	567	566	561	01	02	586	15	35	443	143
23	558	565	567	579	571	566	559	569	565	567	568	544	422	401	497	520	505	520	534	535	554	550	554	555	03	45	594	13	12	284	310
24	566	612	621	608	604	608	582	585	584	(594	570)567	557	476	512	547	558	561	562	563	565	565	567	569	570	02	00	659	(13	44)	(435)	(224)
25	573	573	571	569	567	562	558	557	570	476	544	573	570	459	422	517	453	531	496	543	528	505	536	659	23	32	708	13	47	277	431
26	597	612	606	594	579	578	588	594	598	530	420	473	461	573	435	419	546	516	509	532	578	571	581	611	01	51	674	15	34	197	477
27	671	635	624	638	612	623	605	589	527	408	557	461	405	485	492	492	474	534	577	562	544	546	550	578	00	06	786	12	17	216	570
28	586	616	638	651	613	616	612	615	463	511	516	527	586	519	584	571	557	578	574	561	570	581	574	604	09	02	747	08	31	235	512
29	(624)	627	643	606	663	(651)																									
Mean	588	596	598	595	598	593	584	562	552	531	547	549	535	523	534	521	525	534	541	552	559	567	574	586	560	DESIGNATIONS	345				
Mean *	568	572	576	575	575	577	576	572	572	574	571	563	552	539	548	545	552	554	557	558	560	561	561	561	563	* Ten least days disturbed	112				
Mean †	569	574	574	574	575	575	573	570	570	570	566	560	551	547	545	546	558	559	562	563	563	563	562	563	564	† Five international quiet days					
Mean ‡	637	646	645	621	634	612	564	494	470	472	517	560	572	548	590	508	468	417	444	496	534	574	615	640	553	‡ Five international disturbed days					
																									553	() Approximate					

c Means of 4 values

TABLE 35

HOURLY VALUES OF VERTICAL INTENSITY

64000 plus tabular quantities expressed in gammas

G. M. T. used

JUNE 1952

Day	Hour																								Mean	24	23	22	21	20	19	18	17	16	15	14	13	12	11	10	9	8	7	6	5	4	3	2	1	Range
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23																										
1	585	570	562	571	594	623	602	600	596	571	550	530	531	527	551	559	567	570	569	566	561	558	555	558	558	568	05 06	642	13 19	515	127																			
2	558	565	582	594	598	608	592	594	588	584	581	574	563	531	519	548	561	566	559	543	546	568	558	556	558	568	05 10	613	14 15	504	109																			
3	570	570	579	588	609	602	596	588	585	578	570	567	565	563	558	543	538	531	516	538	552	566	559	559	568	566	04 30	620	15 30	502	114																			
4	585	605	596	584	574	573	573	572	578	582	573	561	555	554	554	543	547	559	565	558	558	559	559	554	547	07 38	620	15 24	536	84																				
5	556	558	567	582	584	573	575	588	605	593	502	520	505	502	458	435	516	552	559	559	562	559	559	558	547	07 58	623	15 24	554	282																				
6	556	556	567	566	567	569	575	588	605	601	582	567	568	558	555	555	556	559	559	561	562	558	559	558	558	09 04	601	12 02	511	69																				
7	555	559	559	562	569	570	569	567	565	574	586	574	548	538	554	555	554	556	544	555	547	544	555	554	547	07 58	710	10 52	98	30																				
8	561	561	570	574	588	624	569	569	584	589	570	594	581	534	547	575	570	561	559	555	546	555	554	547	546	07 58	751	14 36	214	612																				
9	570	581	584	582	586	571	569	562	568	602	584	570	571	565	528	488	535	543	554	555	546	554	554	554	546	06 29	629	14 53	276	537																				
10	586	578	584	579	586	588	612	586	594	588	586	601	571	565	528	488	535	543	554	555	546	554	554	554	546	06 29	654	14 53	276	353																				
11	562	571	584	579	574	573	573	579	570	570	579	582	586	516	543	558	558	558	555	555	552	554	554	554	554	06 29	610	13 24	493	206																				
12	556	559	567	567	569	567	569	570	561	555	559	558	556	546	547	551	555	556	556	552	554	554	554	554	554	07 31	574	13 19	535	117																				
13	546	554	561	566	571	584	585	585	638	585	485	432	458	584	586	600	477	497	544	492	544	558	561	558	560	09 11	693	11 51	214	179																				
14	567	558	574	597	625	586	573	582	615	597	478	586	501	466	547	544	555	555	558	561	558	577	578	573	559	09 16	708	14 53	264	385																				
15	567	567	582	596	596	613	581	600	610	628	520	461	489	606	489	448	497	556	566	559	559	566	559	559	548	06 56	659	13 08	372	287																				
16	565	562	570	586	597	589	610	584	609	543	474	543	513	431	473	494	504	531	544	504	531	569	569	561	569	12 02	663	13 30	461	202																				
17	555	559	586	559	598	570	562	562	563	570	577	567	561	508	534	527	569	561	566	559	566	569	569	570	560	12 24	571	12 57	515	56																				
18	559	559	567	559	563	562	565	567	570	567	561	559	552	546	542	547	554	556	554	548	555	556	558	558	558	08 20	574	13 07	515	59																				
19	552	552	556	558	556	555	555	555	556	558	562	558	559	546	543	546	548	555	556	558	558	558	558	558	558	12 02	586	14 40	532	54																				
20	559	555	555	555	555	555	561	588	615	589	577	561	504	434	447	478	408	473	552	555	555	555	555	555	555	08 16	633	16 38	251	362																				
21	559	555	555	555	555	555	561	588	615	589	577	561	504	434	447	478	408	473	552	555	555	555	555	555	555	15 28	750	15 00	249	501																				
22	571	585	608	620	594	593	600	610	588	556	575	446	458	454	498	584	589	555	520	543	570	575	579	579	562	14 08	638	12 37	284	354																				
23	616	644	656	579	574	602	581	588	570	559	558	555	440	488	540	579	567	554	552	546	562	561	567	567	567	03 46	635	11 46	335	300																				
24	588	584	581	581	600	585	584	596	581	516	471	467	540	502	473	567	582	570	570	566	561	561	562	562	561	06 57	693	13 59	381	312																				
25	562	586	612	624	600	608	642	615	621	623	621	600	523	450	480	465	466	527	552	546	544	550	558	573	561	14 04	613	11 57	463	150																				
26	569	573	570	586	609	608	567	563	561	563	570	519	544	596	596	586	571	569	567	561	558	567	561	558	568	23 56	610	21 31	480	130																				
27	584	584	584	582	571	570	570	570	570	570	571	573	559	546	544	540	550	556	555	554	543	504	530	573	558	09 45	739	(04 25)	116	623																				
28	562	567	570	600	206	255	330	355	426	555	543	617	627	638	547	559	554	555	556	570	581	578	570	570	570	15 28	750	15 00	249	501																				
29	570	573	578	580	569	572	573	577	580	572	547	540	536	533	528	537	545	552	552	553	557	557	556	561	561	14 08	638	12 37	284	354																				
30	570	573	578	580	569	572	573	577	580	572	547	540	536	533	528	537	545	552	552	553	557	557	556	561	561	14 08	638	12 37	284	354																				
Mean	564	568	572	572	570	571	570	573	573	574	571	558	557	548	549	553	554	558	558	554	555	555	556	556	556	* Ten least disturbed days	562	15 00	249	501																				
Mean	556	559	562	564	565	565	566	569	573	575	568	558	554	547	548	549	550	554	554	552	555	555	556	556	556	† Five international quiet days	559	13 59	381	312																				
Mean	593	596	600	580	484	516	521	538	550	564	540	503	514	552	544	580	542	542	520	540	563	566	561	569	† Five international disturbed days	596	09 45	739	(04 25)	116																				
Mean	570	573	578	580	569	572	573	577	580	572	547	540	536	533	528	537	545	552	552	553	557	557	556	561	561	DESIGNATIONS	558	15 00	249	501																				
Mean	564	568	572	572	570	571	570	573	573	574	571	558	557	548	549	553	554	558	558	554	555	555	556	556	556	* Ten least disturbed days	562	15 00	249	501																				
Mean	556	559	562	564	565	565	566	569	573	575	568	558	554	547	548	549	550	554	554	552	555	555	556	556	556	† Five international quiet days	559	13 59	381	312																				
Mean	593	596	600	580	484	516	521	538	550	564	540	503	514	552	544	580	542	542	520	540	563	566	561	569	† Five international disturbed days	596	09 45	739	(04 25)	116																				
																										() Approximate																								

TABLE 37

HOURLY VALUES OF VERTICAL INTENSITY

54000 plus tabular quantities expressed in gammas

G.M.T. used

AUGUST 1952

Day	Hour																								24 Mean	Maximum		Minimum		Range		
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23		h	m	h	m			
1	536	540	548	560	576	572	585	606	589	597	613	578	547	536	534	544	542	537	534	530	532	529	522	521	557	07	16	639	23	52	521	118
2	532	533	534	545	583	651	562	570	601	605	602	582	574	549	536	540	523	507	480	514	541	542	534	537	528	05	59	672	08	43	235	437
3	536	540	544	544	536	547	583	464	345	440	512	506	463	493	477	504	604	597	557	560	551	549	549	542	544	10	36	658	15	26	447	211
4	514	548	549	556	568	557	549	571	568	600	597	553	544	541	534	504	495	518	495	519	536	521	529	530	526	07	53	615	11	06	356	259
5	549	557	574	608	611	563	549	570	556	585	540	536	481	503	474	459	508	529	529	534	545	518	548	547	542	07	58	654	10	45	366	268
6	548	570	574	578	556	551	547	576	525	563	589	586	493	529	519	508	525	529	529	530	545	545	541	541	546	07	56	626	12	34	379	247
7	556	568	548	548	560	582	583	556	585	597	582	536	462	451	534	545	545	541	533	529	529	532	532	535	544	09	06	619	13	10	379	240
8	541	542	600	542	545	544	541	538	537	537	537	540	519	508	521	530	533	530	503	512	519	517	515	517	530	13	34	548	18	51	483	65
9	525	574	600	589	585	601	597	597	583	575	572	557	556	555	548	549	547	544	545	542	536	534	530	532	550	10	41	604	10	57	502	102
10	541	551	559	572	570	553	549	544	545	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
11	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
12	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
13	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
14	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
15	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
16	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
17	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
18	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
19	540	570	572	563	570	566	562	581	597	590	564	542	534	542	547	466	453	541	541	518	507	521	523	525	543	08	35	604	15	55	331	273
20	551	556	571	583	598	622	564	559	562	525	524	544	532	510	521	417	423	483	537	543	548	549	551	548	549	09	29	662	15	50	341	347
21	559	560	563	575	573	571	613	603	536	556	551	553	495	518	534	544	545	543	529	519	532	536	537	552	553	02	32	581	11	34	345	45
22	544	558	589	577	560	558	548	548	549	559	559	558	548	536	541	547	545	544	544	544	544	544	544	544	548	06	58	562	12	24	336	30
23	549	555	556	562	548	549	548	548	560	579	571	563	551	548	544	544	543	536	536	534	533	536	539	541	551	02	23	627	18	21	525	102
24	544	548	551	551	555	551	548	547	547	547	571	563	553	537	539	536	537	534	533	532	533	536	536	537	542	03	51	563	12	41	509	80
25	545	549	551	558	559	559	551	547	547	549	552	534	548	548	548	545	545	544	537	534	533	530	525	528	544	03	51	563	22	04	521	49
26	532	536	549	556	564	571	574	590	571	575	579	534	560	560	548	545	545	544	524	524	543	547	545	544	550	07	09	671	17	04	474	197
27	545	548	559	563	571	575	583	574	563	559	549	545	545	547	547	547	547	544	540	543	544	543	539	536	552	06	33	592	23	05	534	58
28	536	545	551	556	559	560	560	553	548	547	549	549	547	545	546	366	397	477	485	494	503	496	519	536	558	03	44	563	15	50	537	326
29	560	575	639	673	626	573	517	277	547	549	537	530	536	544	541	533	530	506	534	536	536	534	547	544	555	03	13	703	06	32	489	214
30	543	545	555	563	578	577	592	616	628	601	488	370	432	517	536	548	552	558	556	547	537	533	534	534	543	09	00	649	11	20	287	362
31	544	553	562	568	570	570	564	566	554	564	550	529	521	533	531	518	522	531	532	533	536	537	538	544							194	

DESIGNATIONS

Ten least disturbed days

† Five international quiet days

‡ Five international disturbed days

() Approximate

Insufficient data

TABLE 40

HOURLY VALUES OF VERTICAL INTENSITY

NOVEMBER 1952

54,000 plus tabular quantities expressed in gammas

G. M. T. used

Day	Hour																								Mean	24	Range
	0	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	21	22	23			
1	608	604	577	575	574	574	573	560	559	549	466	423	421	424	498	269	476	558	506	524	517	548	547	560	530	51	206
2	586	578	573	563	569	575	558	560	543	562	548	405	477	483	370	387	410	489	522	518	529	536	539	540	518	04	288
3	545	548	558	562	567	570	575	559	559	547	519	537	489	506	513	474	521	530	532	525	524	532	533	537	536	09	412
4	547	555	552	552	556	544	556	570	551	539	536	533	532	532	532	529	524	524	522	521	522	524	532	534	538	07	518
5	544	548	548	537	540	547	537	540	547	549	533	524	465	406	406	465	502	519	521	519	519	522	521	521	522	03	371
6	521	524	528	524	528	528	604	592	547	494	524	473	442	503	536	545	509	539	529	518	524	524	524	522	531	07	252
7	532	537	551	562	570	575	579	559	545	537	522	453	489	492	511	488	504	506	451	387	436	469	492	544	512	08	359
8	548	548	555	563	568	604	588	566	534	495	464	492	525	496	476	498	522	521	510	502	509	530	537	533	529	05	428
9	534	539	545	543	545	544	544	543	539	536	533	532	532	532	532	533	532	529	526	530	530	530	532	530	535	04	519
10	536	539	544	551	548	545	551	548	545	539	534	530	524	529	533	532	494	492	503	511	524	524	525	522	530	06	481
11	530	534	547	549	551	549	556	560	555	547	533	524	522	521	529	530	528	529	532	532	530	526	525	529	536	07	519
12	533	533	540	544	548	547	545	539	536	535	532	524	521	525	528	528	530	533	534	532	529	526	522	521	533	03	511
13	521	521	524	535	547	559	574	577	578	558	511	536	533	524	521	519	518	522	522	521	522	524	524	519	533	08	489
14	519	521	524	525	530	559	592	592	558	532	518	530	514	521	521	496	483	509	510	504	506	524	524	521	526	06	465
15	521	521	521	525	530	559	596	568	563	563	556	522	318	604	588	566	544	559	547	534	532	532	533	534	540	14	115
16	543	547	548	547	545	547	548	568	526	504	484	434	495	477	470	479	503	509	506	457	424	487	530	534	509	07	342
17	561	569	563	557	550	552	545	550	576	549	541	540	535	519	529	527	531	535	535	535	529	535	537	549	544	08	508
18	542	544	552	557	557	553	553	552	552	550	533	529	525	519	534	518	519	525	529	530	527	530	534	538	538	04	481
19	535	541	553	550	549	546	540	535	537	538	537	538	537	535	534	533	533	531	526	522	520	519	523	533	536	08	597
20	535	541	553	546	538	578	612	516	414	516	663	710	689	644	576	541	542	530	526	542	540	537	535	549	561	11	209
21	552	560	567	572	556	559	561	549	540	527	477	315	403	335	599	557	534	560	537	545	545	538	540	549	527	14	165
22	549	549	559	549	550	552	552	563	576	508	535	529	530	531	531	546	545	549	548	540	540	538	542	545	552	06	467
23	545	549	563	572	565	553	545	540	552	569	520	527	508	410	417	429	492	526	537	538	537	537	537	537	534	08	375
24	544	549	549	546	556	553	562	566	594	540	535	533	501	454	485	463	362	417	473	376	414	459	496	555	525	09	207
25	579	561	555	594	604	625	561	511	535	550	493	563	413	437	693	669	549	546	499	535	559	559	564	576	558	13	361
26	604	601	612	604	563	590	606	604	569	548	377	429	520	540	579	526	492	561	499	546	552	551	550	552	549	03	500
27	553	553	555	561	564	565	563	574	590	481	535	537	557	555	549	519	549	533	505	537	552	557	559	560	548	09	277
28	561	561	571	572	567	576	608	578	555	559	552	459	451	469	470	505	508	505	526	535	537	545	550	552	536	06	266
29	548	551	555	557	559	566	569	560	550	537	522	507	500	501	518	513	510	525	521	516	521	528	532	539	534	06	350
30	539	543	547	548	550	549	550	551	552	544	532	531	528	520	518	521	521	524	525	525	525	526	527	530	534	06	428
Mean	536	540	546	547	549	547	550	552	545	539	534	529	526	528	531	530	522	521	523	525	527	526	527	527	534	06	350
Mean	574	571	569	573	567	585	587	555	534	541	507	532	509	500	566	538	484	522	511	504	522	531	538	558	541	06	266
Mean	548	551	555	557	559	566	569	560	550	537	522	507	500	501	518	513	510	525	521	516	521	528	532	539	534	06	350
Mean	539	543	547	548	550	549	550	551	552	544	532	531	528	520	518	521	521	524	525	525	525	526	527	530	534	06	428
Mean	574	571	569	573	567	585	587	555	534	541	507	532	509	500	566	538	484	522	511	504	522	531	538	558	541	06	266

DESIGNATIONS
 * Ten days disturbed
 † Five international quiet days
 ‡ Five international disturbed days
 () Approximate

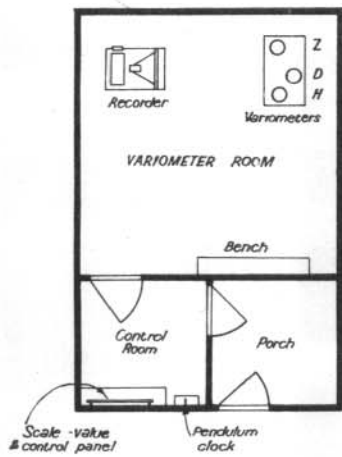


FIG. 1
VARIOMETER HUT

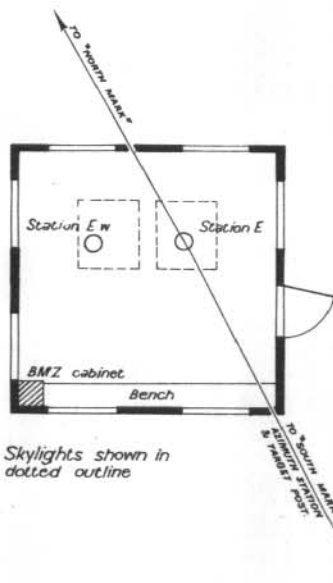
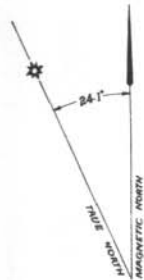
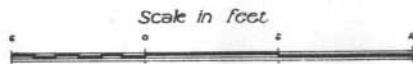


FIG. 2
ABSOLUTE HUT

Note: Skylights shown in dotted outline



GEOPHYSICAL ACTIVITIES AT MACQUARIE ISLAND 1952-1953
MAGNETIC OBSERVATORY BUILDINGS
FLOOR PLANS

Fraser
GEOPHYSICIST



FIG. 1 VARIOMETER HUT



FIG. 2 ABSOLUTE HUT

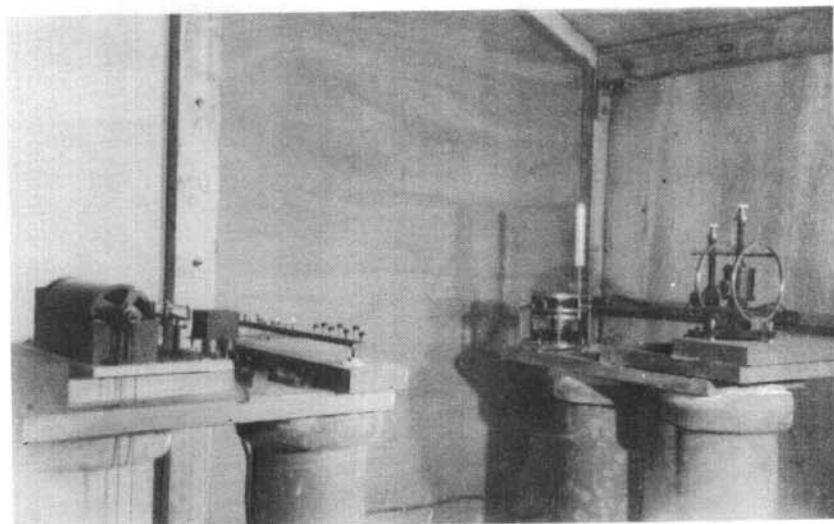


FIG. 1 Ld COUR MAGNETOGRAPH

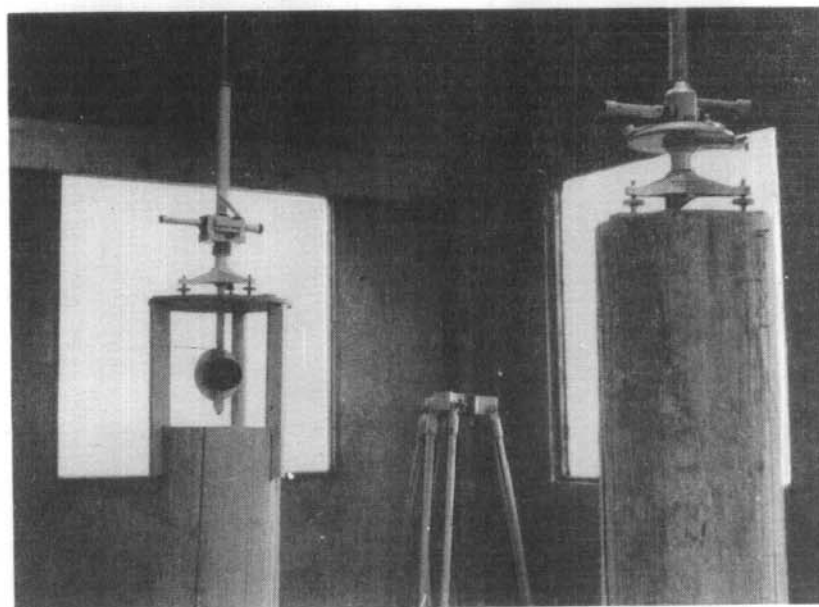


FIG. 2 B.M.Z. and Q.H.M. INSTRUMENTS