書誌第285號

水路部報告

第8卷

昭和7-8年日本磁氣測量

THE

BULLETIN

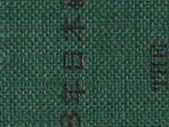
OF THE

HYDROGRAPHIC DEPARTMENT,

IMPERIAL JAPANESE NAVY.

VOLUME VIII.

Magnetic Survey of Japan, 1932-33.



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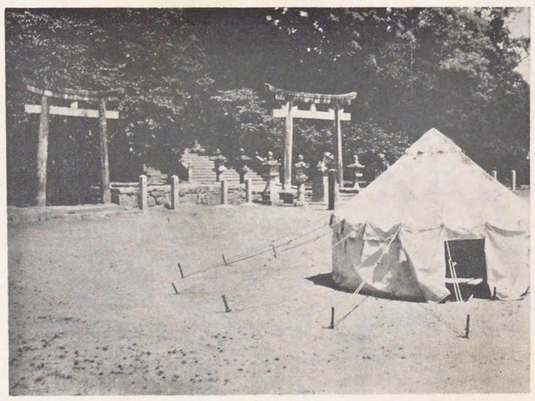
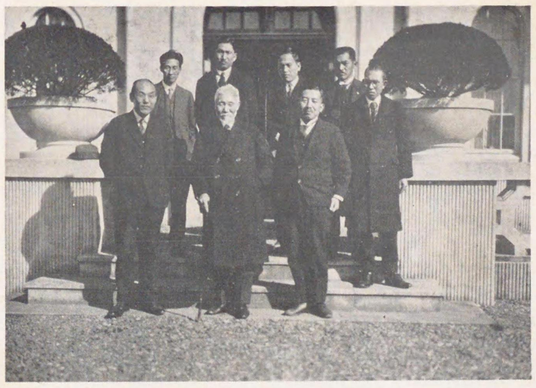
1936

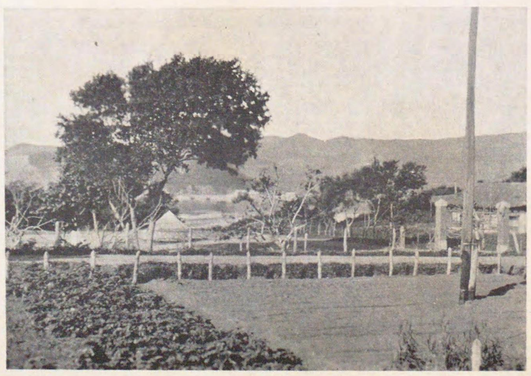
Fig. 1.—Pictures of the Magnetic Survey.



At Izuhara, Kyûsyû.



February 1932, at the Kakioka Magnetic Observatory.
Left to right, back row — Imamiti, Kudô, Kuwahara, Kobayasi, Muramoto;
front row — Ono, Tanakadate, Watanabe.



At Zyôsin, Tyôsen.

At Take Sima, Torakku Syotô, Higasi-Karorin Syotô.

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PREFACE.

This publication is the third of the reports on the decennial magnetic surveys carried out by the Hydrographic Department of Japan. The first of them, published as Volume II of the "Bulletin of the Hydrographic Department", contains the results of all magnetic observations carried out by the Department during the interval of from April 1912 to May 1913 and the magnetic charts for the epoch 1913.0 deduced from them. The second, the Volume V of the "Bulletin", contains the results of all magnetic observations of the Department made by the magnetic observing parties from June 1922 to August 1923, and by the hydrographic surveying parties from July 1919 to July 1920, with magnetic charts for the epoch 1923.0.

The decennial magnetic survey, the results of which are given in this volume, was commenced in April 1932 and ended in October 1933. The observations were made at 234 stations included in Japan, Manchoukuo, and Nanyô Guntô [South Sea Islands]—Mâsyaru [Marshall], Karorin [Caroline] and Mariana—under Japanese Mandate.

It is much to be regretted that, in progress of this survey, A. Muramoto, Naval Engineer, who had planned this survey, died on July 7, 1933. He devoted himself to every division of work of this survey, especially to the construction of the "Nippon Suirobu type Magnetometer". This magnetometer improved by him was used throughout this survey. All magnetic observations were much simplified by the adoption of this magnetometer, and not only the time required was saved very much, but their accuracies were added.

At the beginning of this survey, the Polar-Year observation was commenced,

and we endeavoured to make our observations on as many international days of observations as possible to cooperate with it.

For the construction of the magnetic charts, all the available materials, furnished by the "Central Meteorological Observatory", Tokyo, the foreign magnetic observatories in the vicinity of Japan, the "Central Geophysical Observatory", Leningrad, and the "Carnegie Institution of Washington" were utilized in addition to our data.

The constants of the magnetometers were determined at the laboratory of the "Central Bureau of Weights and Measures", and the comparisons of the magnetometers were carried out at the Kakioka Magnetic Observatory.

I wish to express our sincere thanks to Mr. N. Watanabe, the Director of the "Central Bureau of Weights and Measures", for his many valuable help and advices, and kind permission to use the installation under his charge. Our thanks are also due to Dr. T. Okada, the Director of the "Central Meteorological Observatory", and Mr. S. Imamiti, the Director of the "Kakioka Magnetic Observatory", for their kindness in connection with the comparison of the magnetometers.

T. ÔTAGAKI,
Rear-Admiral and Chief Hydrographer,
Hydrographic Department,
Imperial Japanese Navy.

October 1936.

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RESULTS OF MAGNETIC OBSERVATIONS

1932–1933

RESULTS OF MAGNETIC OBSERVATIONS.

GENERAL REMARKS.

The magnetic survey principally dealt with in the present volume is the third of the decennial magnetic surveys carried out by the Department and this was begun in April 1932 and completed in November 1933. During the period this survey was extended to all parts of Japan, Manchoukuo and Nanyô Guntô (South Sea Islands) under Japanese Mandate, and many stations were established especially in the isolated islands, the total number of occupied stations footing up to 234.

Nine persons had taken the chief charge of this survey. But, the total was 20 if those in the comparison observations would be added.

In 1932, three field parties made the observations at the stations in almost all parts of Japan, Manchoukuo and Mariana Syotô, Mâsyaru Syotô (Marshall Islands) and Higasi-Karorin Syotô (East Caroline Islands). In 1933, four field parties made the observations in Ogasawara Guntô, Izu Syotô, Tisima Rettô, Nisi-Karorin Syotô (West Caroline Islands) and in the parts of Japan proper which had been remained to be surveyed.

The used magnetometers are of the "Nippon Suirobu" type. It is a portable instrument designed by A. Muramoto, suitable for measurement of the three elements of the earth magnetism (declination, dip and horizontal intensity) by the electromagnetic method. The brief history of the improvement of the magnetometer will be described hereafter.

The Japanese physicists have already made numerous contributions to the improvement and progress of the portable magnetometer for field work. Dr. Tanakadate found the method of determining the magnetic meridian by the

electromagnetic one and made it public in the "Proceeding of the Royal Society Edingburgh, 1883—4". He also contrived in 1887 the magnetometer-theodolite for the measurement of declination by this method and horizontal intensity by the Gauss-Lamont's method. The magnetometers of this type were used in the surveys, 1887, 1893—6 and 1912—3 (the last one is the first survey made by the Hydrographic Department). The details of the Tanakadate's type magnetometer are described in the "Journal of the College of Science, Imperial University of Tokyo, Vol. II, No. 3, 1888".

The simple way to measure horizontal intensity by an electromagnetic method employing a Helmholtz-Gaugain Coil was attempted by Watson in 1902 and published in the "Philosophical Transactions, Vol. 198, P. 431, 1902". In 1921, N. Watanabe completed his special scheme for the measurement of horizontal intensity by employing a Helmholtz-Gaugain Coil, and constructed the 1922 type Magnetometer of the Hydrographic Department measuring declination by the Tanakadate's method and horizontal intensity by his own method. The description of this is given in the "Japanese Journal of Astronomy and Geophysics, Vol. I, No. 6, 1924" and the "Bulletin of the Hydrographic Department, Vol. 5, 1926". The magnetometers of this type were used in the survey, 1922—3, but, after that, all of them as well as other magnetometers were destroyed by the great earthquake in September 1923.

The methods of determination of declination and horizontal intensity had been improved very much as described above; but that of dip had remained to employ the Dip-Circle in all of the past surveys in Japan. However, the determination of dip with the Barrow's Dip-Circle in general use has been very tedious and time-consuming.

As, not only such were the circumstances, but the galvanometer was already attached to the 1922 type magnetometer, A. Muramoto, Naval Engineer, designed in 1927, with a view to simplifying and making speedy observation, a new type magnetometer, combining the principle of the 1922 type magnetometer and

that of the Earth-Inductor. The details of this magnetometer are described in the "Japanese Journal of Astronomy and Geophysics, Vol. VII, No. 3, 1930".

At the request of this Department, the magnetometers of this type were manufactured at the "Sokkisya" (Measuring Instrument Manufacturing Co.) and designated as the "Nippon Suirobu type Magnetometer". These magnetometers were used throughout this magnetic survey, 1932—3.

ORGANIZATION OF THE SURVEY.

It is beneficial for our magnetic survey to complete the survey in a short period with many observation parties. In this magnetic survey, the inspector was A. Muramoto (during the first half of the period of this magnetic survey), there being six field parties in all. The members of each party and their periods of observations are shown in Table 1.

In the middle of this survey, A. Muramoto, Naval Engineer, died on July 7, 1933 and after that S. Kuwahara, the writer of the present report, had succeeded his work from September 1933. The principal persons who had taken part, at various times, in the determinations of instrumental constants and the intercomparisons of magnetometers at Kakioka, in the final office reductions, in the constructions of magnetic charts or in the preparations of results for publication of this volume, are: A. Muramoto, S. Kuwahara and S. Miyahara.

Mr. N. Watanabe devoted many instructive suggestions for all kinds of works throughout this survey.

Table 1.—Summary Showing the Magnetic Survey, 1932—33.

Party	Member	Period of Observation	Number of Stations	Instrument Used
1	A. Muramoto S. Urai	May 8, 1932—Feb. 3, 1933 〃 〃 〃 〃 〃 〃	67	No. 5
2	T. Ogawa H. Higasinaka S. Hayami	May 11, 1932—Oct. 19, 1932 〃 〃 〃 —Aug. 7, 1932 Aug. 14, 1932—Oct. 19, 1932	40	No. 4
3	S. Kuwahara S. Tanaka	April 28, 1932—Oct. 4, 1932 〃 〃 〃 〃 〃 〃	26	No. 3
4	T. Ogawa M. Mituno Y. Kurokawa H. Higasinaka	May 9, 1933—Oct. 29, 1933 〃 〃 〃 —July 18, 1933 Aug. 9, 1933—Oct. 29, 1933 〃 〃 〃 〃 〃 〃	51	No. 5
5	S. Kuwahara S. Urai	April 22, 1933—Aug. 30, 1933 〃 〃 〃 〃 〃 〃	23	No. 3
6	S. Kuwahara T. Ogawa	Jan. 15, 1933—Feb. 14, 1933 〃 〃 〃 〃 〃 〃	13	No. 4

THE STATIONS.

The area covered by this magnetic survey was extended to all parts of Japan, Manchoukuo and the South Sea Islands—Mâsyaru (Marshall), Karorin (Caroline) and Mariana—under Japanese Mandate.

In choosing stations, we endeavoured to distribute them as uniformly as possible over the whole area, and at the same time to repeat as many stations of the foregone surveys as possible, to obtain many secular change data. But, even in the case of the stations established by the Department, the growth of towns or the introductions of electric railways or other sources of artificial local disturbance had in many cases prevented the reoccupation of the original site.

In such a case we had endeavoured to occupy the station as near as possible to the original site, establishing a new station, usually at a meteorological observatory if possible. In any case, when it was suspected that the result of observation at a station was affected by the local anomaly, one or more stations were established near the station. In a small island, more than two stations symmetrical with regard to its topographical aspect were choosen with the object in view to compensate, in the mean, the effect of its magnetic peculiarity. The distribution of the stations and their situations with respect to the original sites are as in Table 2.

Table 2.—Number of the Magnetic Stations, 1932—33.

Region	Station				Total Number of Stations, 1932—33.	Total Number of Stations, 1922—23.
	Repeated Station			New Station		
	A	B	C			
Tisima Rettô	3	2	3	6	14	—
Karahuto	1	5	2	7	15	6
Hokkaidô	5	6	—	2	13	12
Honsyû	20	10	2	11	43	42
Sikoku	2	1	—	—	3	5
Kyûsyû	7	4	—	8	19	15
Manchoukuo	1	2	—	14	17	2
Tyôsen	11	9	1	10	31	28
Izu Syotô	—	4	—	9	13	—
Ogasawara Guntô	5	2	—	5	12	7
Nansei Syotô	1	1	1	1	4	4
Taiwan	3	—	1	3	7	8
Mariana Syotô	3	—	—	5	8	3
Nisi-Karorin Syotô	4	—	—	3	7	4
Higasi-Karorin Syotô	8	—	—	14	22	8
Mâsyaru Syotô	3	—	—	7	10	3
Sum	77	46	10	105	238	147

In the column of "Repeated station" the heading letter of sub-column, A indicates that the old station was reoccupied exactly, B that the new station was established within 0.5 kilometre of the old one, and C that the new station was

at a still greater distance from the old one.

INSTRUMENTS USED AND METHODS OF OBSERVATIONS.

The magnetometer used in this survey was the "Nippon Suirobu type Magnetometer". The explanations of this instrument was already made in the "Japanese Journal of Astronomy and Geophysics, Vol. 7, No. 3, 1930" as described in "General Remarks". The brief information is given in the following paragraphs.

In this magnetometer, either a Telescope-Rotating-Coil or a Helmholtz-Coil and a mirror magnetometer can be arranged on the horizontal circle. By attaching the electrical accessories—Rheostat, Galvanometer, Current Standard Meter and several dry cells—to it, dip or declination and horizontal intensity can be measured. Though the methods of observations of declination and horizontal intensity with this instrument are identical with those with the 1922 type magnetometer, the important difference consists in the use of the Earth-Inductor, instead of the Dip-Circle in the 1922 type.

Observation of Azimuth.

The arrangement for the observation of azimuth is shown in Figure 2. Both the vertical and horizontal circles of this theodolite are 17 cm. in diameter and graduated to 20′. The circles are read by a microscope reading device direct to two minutes and by estimation to two-tenth of a minute of arc. The aperture of the telescope is 5 cm. and the focal distance of the objective is 27 cm. For the observation of the star in the night, the telescope is provided with an apparatus

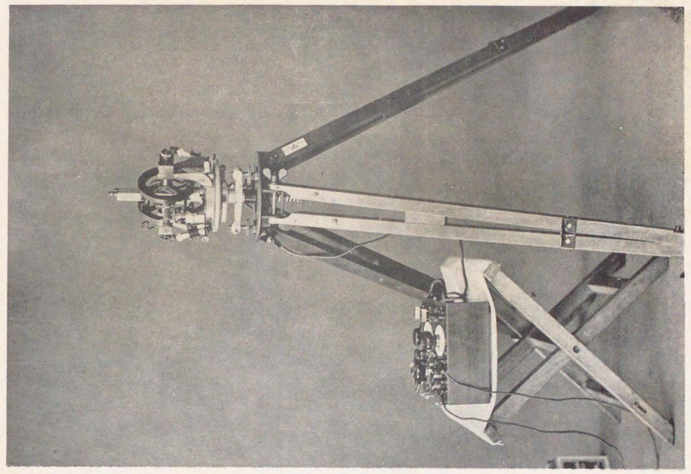


Fig. 3.—Arrangement for Declination Observation.

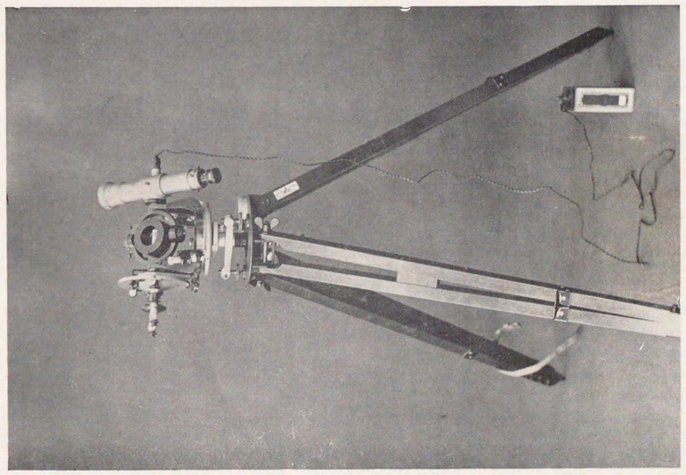


Fig. 2.—Arrangement for Azimuth Observation.

for illuminating its cross wires.

The true azimuth of a line of reference at a magnetic station is determined by the method of Time Azimuths, observing the polaris and any stars near their greatest elongations in the east and west, in order to diminish the error in azimuth arising from the errors of time and geographical position assumed. The sun is not used expect for the cases under unfavourable conditions to the above.

The correction of chronometer is determined by the time signals by wireless, and the geographical position of a magnetic station is taken from the map with sufficient accuracy, for the whole area surveyed has been well mapped.

Observation of Declination.

The arrangement for the observation of declination is, as Figure 3 shows, such that the Helmholtz-Coil, auto-collimating telescope and mirror magnetometer are put on the theodolite, each in its proper position, and the terminals of the coil are connected with the rheostat and dry cells. The hanging system of the mirror magnetometer consists of a magnet, two mirrors and a duralumin frame holding them. This hanging system is hanged with a slender thread of a spider in the case of the mirror magnetometer. The magnet is a hollow one made of K. S. steel whose diameter is 1 mm. and length 3 mm. The upper mirror attached to the hanging system looks approximately in the same direction as the axis of the magnet, while the lower perpendicularly.

Three mirror magnetometers are given to the magnetometer-theodolite. One of them is used as the standard mirror magnetometer and it is somewhat different in construction from the other two. In the case of the standard mirror

magnetometer, its hanging system can be taken off from the thread. It is fitted with a weight weighing equally to the hanging system. The twist of its thread can be loosed by hanging the weight in place of the hanging system. The standard mirror magnetometer is not used for practical observation, for it is somewhat inconvenient to it. During this survey, the change of the instrumental correction of the magnetometer-theodolite with the usual mirror magnetometer is examined at some stations by comparing it with the theodolite with the standard mirror magnetometer. However, the abrupt change of its instrumental correction was not observed throughout this survey.

In the observation, the magnetic axis of the coil system is placed nearly in the plane of magnetic meridian. Then, an electric current is sent which produces the magnetic field opposite to the horizontal component of the earth's magnetism through the coil. The intensity of the current is so controlled by a rheostat that the period of oscillation of the suspended magnet of the mirror magnetometer may be increased to nearly three times compared with that in the natural magnetic field. Then, putting off and on the electric current in the coil system and inspecting the deflection of the suspended magnet with the auto-collimating telescope, the observer turns the axis of the coil system in the horizontal plane with the Y's until it comes in the direction where no change is made, in the direction of the suspended magnet, by the current, and read the circle. Next, he makes the similar observation reversing the coil on the Y's to eliminate the error due to the nonconformity in direction between the geometrical and magnetic axis of the coil system. The declination is determined by the mean value of these two readings and the reading of the true north obtained by the astronomical observations. But it should be noted that the optical axis of the telescope for astronomical observation is placed making right angle with the geometrical axis of the coil system.

In the determination of declination, the deflection $\Delta\varphi$ of the suspended magnet from the direction in the natural field, which is caused by the nonconformity in direction between the magnetic meridian and the magnetic field of the coil introduced by current (the subtended angle $\Delta\delta$ is the error in the declination determined) is related to the error $\Delta\delta$ in the declination by the formula

$$\Delta\delta = \frac{H - H'}{H'} \Delta\varphi,$$

where H′ is the intensity of magnetic field of the coil and H is the horizontal component of the earth magnetic field. In this magnetometer the displacement of the image of the central line of the scale in the auto-collimating telescope of one division indicates the deflection of the suspended magnet of 4′.5 of arc. Hence, it is known by the above formula that the error of 0′.1 in declination corresponds to the displacement of the image of 0.2 division, in the case that the period of oscillation of the suspended magnet in the combined field is three times of that in the natural one.

Observation of Horizontal Intensity.

The horizontal intensity is measured by attaching the galvanometer and the current standard meter to the above installation for declination observation and a thermometer to the case of the mirror magnetometer to measure the temperature of the coil system (Fig. 4). The coil system (Helmholtz-Coil) consists of two coils and each of them is 13 cm. in external diameter with 182 windings. The strength of the magnetic field at the centre of this coil system is about 27 gauss per ampere.

The current standard meter consists of three standard cells (two of them are kept in reserve) and three standard resistances of about 96, 135 and 182 ohms, all immersed in a bath of transformer oil, and is used as the standards for

controlling of the electric current flowing in the coil. Thus, by connecting the galvanometer, rheostat and dry cells to the current standard meter and using respective standard resistance, three kinds of currents ca. 0.01C6, 0.0076 and 0.0056 ampere can be established.

As the strengths of the magnetic fields produced by these currents are 0.29, 0.21 and 0.15 gauss respectively, the earth magnetic field of 0.41—0.15 gauss can be measured by a deflection greater than 45°.

The galvanometer is of the Broca type; its total resistance is about 32 ohms, sensibility is 2×10^{-7} ampere. The control magnet is not used for fear of disturbing the earth's field. The total resistance of the rheostat is 450 ohms and adjustment is possible to 10^{-3} ohms.

The method of observation of horizontal intensity is as follows:—

Before the coil system is contacted with electric current, one of the observers turns the magnetometer-theodolite about the vertical axis and fixes it at the position where the magnetic axis of the coil system is perpendicular to the magnetic axis of the suspended magnet in the earth's field; this position is determined by the declination observation. Next, turning auto-collimating telescope until the reflected image of the central line of the scale in the telescope coincides with the line itself, he fixes the telescope on the theodolite. After that, the assistant observer sends through the coil system the most suitable current of the three kinds of the electric currents for the field to be measured. By connecting the both terminals of a standard resistance with the galvanometer and a standard cell, he adjusts the current by the rheostat until there is no deflection of the mirror of the galvanometer. While the former turns the theodolite and makes auto-collimation of the telescope, fixing the telescope to the theodolite (Y's) constant, and read the circle.

Next the similar observation is made on the opposite side of the magnetic meridian by reversing the current. Then the deflection angle is determined by half the difference of these two readings, cancelling the effect of the torsion of

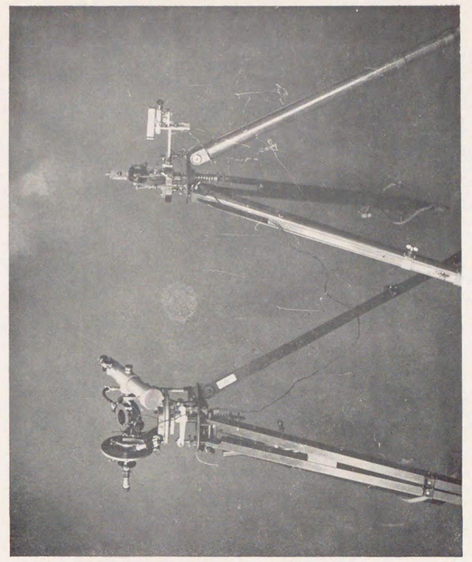


Fig. 5.—Arrangement for Dip Observation.

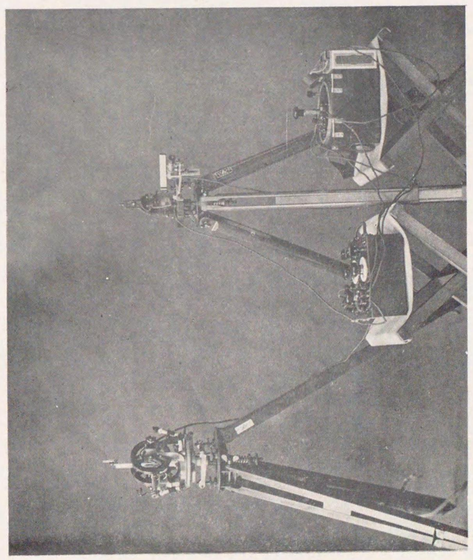


Fig. 4.—Arrangement for Horizontal Intensity Observation.

the thread suspending the magnet.

In this case, since the angle which the magnetic force at the centre of the coil system due to the current makes with the resultant of this force and the horizontal component of the earth's magnetism is always kept at 90°, the horizontal component of the earth magnetic field H will be given by the following formula,

$$H = \frac{H_{20}}{\sin \varphi}\{1+f(\Delta t_c)\}\{1+g(\Delta t_s)\},$$

where H_{20} is the strength of the magnetic field at the centre of the coil system when both the coil system and current standard meter are at the standard temperature 20° C.; $f(\Delta t_c)$ and $g(\Delta t_s)$ are the revisionary quantities for the constants of the coil and current standard meter respectively for their corresponding temperature differences Δt_c and Δt_s from 20° C., taking the both constants at 20° C. as standard; φ is the deflection angle. As the frames of coils of the magnetometers are made of the same material, $f(\Delta t_c)$ is common to all of the coils, and the values of $\log\{1+f(\Delta t_c)\}$ are given in Table 11. But $g(\Delta t_s)$ differs more or less according to the standard cell and standard resistance employed in a combination. The values of $\log\{1+g(\Delta t_s)\}$ are shown in Tables 12—14.

As regards the errors in the horizontal intensity thus determined, they will be described later:—

In the adjustment of the instrument, if the angle which the axis of the suspended magnet makes with the magnetic axis of the coil system differs by θ from 90°, the error ΔH given by the following expression will be produced in the horizontal intensity,

$$\Delta H = -\frac{\theta^2}{2}H.$$

Hence, ΔH amounts to one gamma (10^{-5} C. G. S.) when $H = 0.4$ gauss and $\theta = 24'$.

As the sensibility of the galvanometer is 2×10^{-7} ampere, the deviation of the image of the galvanometer scale of one division, in the adjustment of current flowing in the Helmholtz-Coil, corresponds to the error of smaller than one gamma in the value of horizontal intensity determined, provided that the deflection angle of the suspended magnet is greater than 45°.

The effect which the error of deflection angle $d\varphi$ exercises on the result is given by the formula

$$d\mathrm{H} = -\mathrm{H}\cot\varphi\, d\varphi\ .$$

Since the deflection angle is made always greater than 45°, dH is smaller than one gamma when $d\varphi < 0'.1$ and $\mathrm{H} < 0.4$ gauss.

Observation of Dip.

The arrangement of dip observation is carried out, as Figure 5 shows, by connecting the galvanometer with the commutator of the rotating coil which is mounted on the Y's of the theodolite and equipping the coil with a hand-operated gear to rotate it; the gear ratio is 4 to 1. The rotating coil consists of two coils which are connected in series. Each coil is $0.9^{\mathrm{cm.}} \times 0.9^{\mathrm{cm.}}$ in cross section and its mean radius is 3.7 cm. with 400 windings, the whole resistance being about 25 ohms. The method of dip observation is as follows:—

Setting the rotating axis of the coil in the plane of magnetic meridian which was determined by declination observation, one of the observers rotates the coil by the gear while the assistant observes the current generated in the rotating coil, with the galvanometer connected to it. The inclination of rotating axis is changed in the plane of magnetic meridian according to the information of the current observer.

These processes are repeated until the axis reaches into the direction where generating current disappears in spite of the rotation of the coil. Then the vertical circle is read in this direction of the axis.

The similar observation is made at the other state of the instrument; that is, the theodolite is turned by exactly 180°; to eliminate the index error, determining the dip by the mean of these two readings.

If the rotating axis of the coil makes an angle ε with the plane of magnetic meridian, the error $\Delta\theta$ should be produced in the value of dip and it is given by the following formula:

$$\Delta\theta = \frac{\varepsilon^2}{4}\sin2\theta.$$

$\Delta\theta$ is less than $0'.1$ when $\varepsilon < 37'$, even under the most unfavourable conditions of $\theta = 45°$.

If the angle between the rotating axis and the direction of magnetic field is φ and the coil makes 20 revolutions per second in the field of 0.4 gauss, the maximum strength of the current generated in the coil will be given by the relation

$$\mathrm{i} = 5.2\times10^{-4}\sin\varphi \quad \text{ampere.}$$

As the sensibility of the galvanometer is 2×10^{-7} ampere, the displacement of the image of the galvanometer scale of about one-tenth of a division corresponds to the error of $0'.1$ in the dip.

DETERMINATION OF CONSTANTS.

The electrical constants of the Helmholtz-Coils attached to the magnetometers are determined by the same method as described in the "Japanese Journal of Astronomy and Geophysics, Vol. 1, No. 6, 1924", or the "Bulletin of the Hydrographic Department, Vol. V". All the determinations: the measurement of dimensions of the standard coil, the comparison of the electrical constant of each portable Helmholtz-Coil attached to the magnetometers with that of the standard coil, and the standardization of the currents established by the current standard meters, are carried out two times each before and after the magnetic survey, in the laboratory of the "Central Bureau of Weights and Measures".

Determination of the Electrical Constants of the Standard Helmholtz-Coil.

The standard coil is a Helmholtz-Coil consisting of a marble bobbin and two coils (these are called loops here), each of single turn. The distance between the two loops and the external diameter of each loop are measured with the Brunner type comparator, and the measuring machine manufactured by the "Pratt and Whitney Co. Ltd.", Hartford, on 36 generating lines marked on the bobbin of marble cylinder. The scale used in these measurements is the nickel standard scale No. 348 of one meter manufactured by the "Société Genevoise d'Instruments de Physique", Geneva calibrated by the "Bureau International des Poids et Mesures", and the thermometers used are the *Tonnelot* thermometers No. 1500 and 1501.

Setting the micrometer of each comparator microscope nearly on the middle line of each wire respectively, the distances between inner limits of two wires and those between outer limits of the wires are measured on each generating line. The results of the two series of measurements in January 1934 are as in Table 3.

Table 3.—Results of measurements of the distances between the loops and the diameters of the wires.

Position	Distance between Loops A and B. 1st Measurement 14°.33 C. Inner limits	Outer limits	2nd Measurement 14°.71 C. Inner limits	Outer limits	Position A	Position B	Diameters of wires of Loops A and B. 1st Measurement 14°.33 C. Coil A	Coil B	2nd Measurement 14°.71 C. Coil A	Coil B
	cm	cm	cm	cm			μ	μ	μ	μ
1— 1′	9.94336	10.05238	9.94355	10.05257	1	1′	538.5	551.5	538.6	551.5
2— 2′	4237	5327	4320	5244	2	2′	45.7	63.2	41.4	50.9
3— 3′	4225	5167	4240	5148	3	3′	42.3	51.7	37.9	52.8
4— 4′	4266	5211	4265	5268	4	4′	45.0	49.4	49.6	50.5
5— 5′	4345	5269	4390	5254	5	5′	41.7	50.6	36.3	50.0
6— 6′	4532	5280	4501	5353	6	6′	38.7	36.0	43.4	41.8
7— 7′	4406	5324	4405	5348	7	7′	40.6	51.1	36.1	53.4
8— 8′	4218	5137	4261	5105	8	8′	40.4	51.4	37.0	47.3
9— 9′	4244	5019	4275	5083	9	9′	63.2	41.1	41.7	39.1
10—10′	4284	5098	4254	5184	10	10′	36.1	45.2	44.2	48.6
11—11′	4422	5227	4451	5265	11	11′	33.9	46.5	38.2	43.0
12—12′	4489	5430	4508	5326	12	12′	42.1	51.7	41.8	40.0
13—13′	4252	5254	4209	5194	13	13′	38.8	61.3	41.9	56.4
14—14′	4300	5127	4292	5144	14	14′	37.8	44.8	38.2	46.9
15—15′	4258	5148	4242	5182	15	15′	40.4	48.5	43.5	50.4
16—16′	4158	5150	4269	5041	16	16′	42.3	56.8	40.2	37.0
17—17′	4254	5209	4277	5229	17	17′	38.7	56.6	40.2	54.9
18—18′	4254	5212	4264	5194	18	18′	37.2	45.7	37.1	55.8
19—19′	4271	5075	4255	5165	19	19′	37.3	43.0	40.1	50.8
20—20′	4275	5319	4260	5190	20	20′	45.3	59.0	44.3	48.6
21—21′	4294	5137	4300	5151	21	21′	38.9	45.3	38.9	46.1
22—22′	4331	5012	4389	5127	22	22′	53.5	31.5	41.2	32.4
23—23′	4321	5227	4338	5234	23	23′	42.5	48.0	42.1	47.4
24—24′	4430	5274	4367	5250	24	24′	40.2	45.0	41.8	46.4
25—25′	4016	4908	4029	4944	25	25′	44.2	44.9	43.8	47.5
26—26′	4106	5063	4091	5075	26	26′	46.5	49.0	48.2	49.6
27—27′	4085	4942	4089	5011	27	27′	37.5	48.1	43.9	48.2
28—28′	4171	5106	4174	5144	28	28′	45.6	47.8	42.6	54.2
29—29′	4356	5245	4329	5227	29	29′	41.3	49.5	42.0	47.8
30—30′	4371	5318	4399	5297	30	30′	40.1	54.5	40.2	49.5
31—31′	4405	5286	4399	5280	31	31′	37.9	50.1	38.2	49.9
32—32′	4303	5197	4321	5221	32	32′	33.5	55.8	36.5	53.4
33—33′	4333	5267	4324	5280	33	33′	41.7	51.6	42.5	53.0
34—34′	4344	5267	4318	5238	34	34′	41.4	50.8	43.4	50.6
35—35′	4402	5290	4383	5335	35	35′	41.5	47.3	44.0	51.0
36—36′	9.94446	10.05323	9.94469	10.05295	36	36′	534.9	552.2	533.9	548.6
Mean	9.94298	10.05197	9.94306	10.05202	Mean		541.31	549.35	540.97	548.48

From these results we obtain the following : —

Table 4.—The mean distances between the loops and the mean diameters of the wires.

No.	Temperature	Mean Distance		Mean Diameter of Wire	
		Between Inner Limits of Wires	Between Outer Limits of Wires	Wire of Coil A	Wire of Coil B
	°	cm	cm	cm	cm
1	14.33	9.94298 ±12	10.05197 ±13	0.054131 ±61	0.054935 ±71
2	14.71	9.94306 ±12	10.05202 ±11	0.054097 ±38	0.054848 ±59
Final Mean	14.52	9.943020 ±86	10.051995 ±84	0.054114 ±36	0.054892 ±46

Then the mean distance between the axis of wires of the two loops is

$$9.997508 \pm 0.60^{\mu}\text{cm} \qquad \text{at } 14°.52 \text{ C.}$$

The diameters of the loops are measured to the outer limits of the wire and the results of two series of measurements obtained in January 1934 are shown below (Table 5).

Table 5.—Results of measurements of the external diameters of the loops.

Loop A			Loop B		
Position	1st Measurement 13°.95 C.	2nd Measurement 13°.36 C.	Position	1st Measurement 14°.24 C.	2nd Measurement 13°.78 C.
	cm	cm		cm	cm
1—19	20.04743	20.04722	1′—19′	20.05503	20.05467
2—20	4442	4291	2′—20′	4970	4975
3—21	4580	4607	3′—21′	5295	5281
4—22	4691	4716	4′—22′	5137	5109
5—23	4799	4848	5′—23′	5485	5487
6—24	4840	4904	6′—24′	5559	5553
7—25	4860	4884	7′—25′	5506	5494
8—26	4853	4878	8′—26′	5350	5355
9—27	4673	4672	9′—27′	5143	5129
10—28	4548	4682	10′—28′	5272	5230
11—29	4900	4927	11′—29′	5533	5524
12—30	4808	4811	12′—30′	5664	5653
13—31	4803	4810	13′—31′	5302	5259
14—32	4816	4854	14′—32′	5518	5503
15—33	4864	4890	15′—33′	5430	5400
16—34	4842	4818	16′—34′	5603	5577
17—35	4790	4871	17′—35′	5641	5625
Mean	20.04756	20.04776	Mean	20.05407	20.05389

The mean external diameters of the loops are as follows : —

Table 6.— The mean external diameters of the loops.

No.	Loop A.		Loop B.	
	Temperature	Diameter	Temperature	Diameter
	°	cm	°	cm
1	13.95	20.04756 ±21	14.24	20.05407 ±32
2	13.36	20.04776 ±26	13.78	20.05389 ±32
Final mean	13.66	20.04766 ±16	14.01	20.05398 ±22

Then the mean diameters measured to the axis of wire are

Loop A $19.99355 \pm 1.7^{\mu}\text{cm}$ at 13°.66 C.,

〃 B 19.99909 ± 2.3 〃 14.01 C.

Assuming the expansion coefficient of the marble is 7.9×10^{-6}, the measured dimensions of the standard coil are reduced to the values at the common temperature 14°.00 C. However, this reduction is negligible for the accuracy of one gamma in the observation of horizontal intensity.

The mean half axial distance, $l = 4.99873 \pm 0.30^{\mu}\text{cm}$ at 14°.0 C.,

〃 〃 radius of Loop A, $r_A = 9.99680 \pm 0.84$ 〃 〃 ,

〃 〃 〃 〃 〃 B, $r_B = 9.99954 \pm 1.16$ 〃 〃 ,

〃 〃 of r_A and r_B, $a = 9.99817 \pm 0.72$ 〃 〃 .

The axial intensity F of the magnetic field produced at the centre of the coil system by the electric current i flowing through each loop in the same direction can be calculated from the equation

$$F = \left\{ \frac{0.4\pi a^2}{(a^2+l^2)^{\frac{3}{2}}} + C \right\} i \quad \frac{\text{Amp}}{\text{cm}} \cdots\cdots\cdots\cdots \text{A},$$

where the first term represents the constant of a ideal Helmholtz-Coil and C is the correction term depending on the forms of the wires at the ends of windings of the loops.

The value of $\frac{0.4\pi a^2}{(a^2+l^2)^{\frac{3}{2}}}$ is $0.0899378_{\pm 42}^{5}$ at 14°.0 C. as calculated from the dimensions shown before. The term C (term of end correction) is calculated by the following expression:

$$C = \frac{1}{10} \frac{2l^2-r^2}{(r^2+l^2)^{\frac{5}{2}}} (f_A+f_B)\cdots\cdots\cdots\cdots\cdots\cdots B,$$

where f_A and f_B represent the areas of the circuits extra for ideal Helmholtz-Coil at the end of the windings of the loops A and B respectively and r is the mean of distances from the axis of the coil system to each center of gravity of the small area f_A and f_B. The form of the wire at the end of winding of each loop is inspected by the X-Ray photographs and this is shown in Figure 6A. The coil

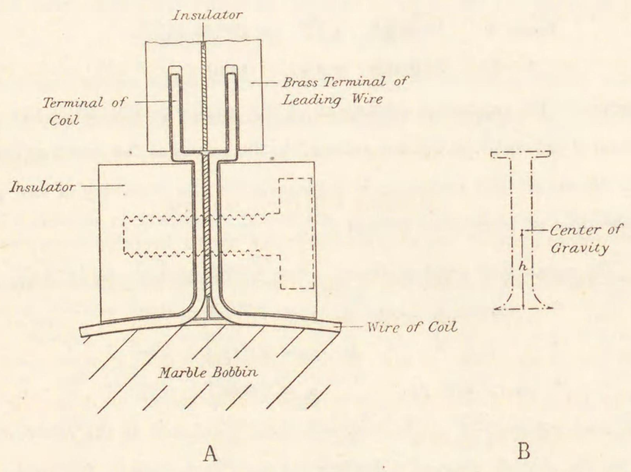


Fig. 6.-Ends of Wire of Standard Helmholtz-Coil and Figure of Circuit for End Correction.

system is connected with electrical circuit by the brass terminals of leading wires at these ends. In the comparison experiment of the constant of the standard coil with that of a portable coil, the effect of the stray magnetic field produced by the leading wires and by other sources are eliminated by a compensating coil connected in series to the circuit. However, the compensator is so adjusted, before

the comparison experiment of the coils, that the magnetic field produced by it balances with the stray field arising from the leading wires which are connected by the ⌴ shaped bare wires at the bottom of their brass terminals. The bare wires are inserted into the holes of the brass terminals, in stead of the terminals of the coil system which are inserted in these holes in the comparison observation. Hence, the circuits with the areas of which the value of C should be calculated have the shapes as shown in Figure 6B. The results of measurements are

Loop	Area (f)	Height (h)
	cm²	cm
A	$0.0705_{\pm 34}$	$0.5427_{\pm 12}$
B	$0.0659_{\pm 21}$	$0.5513_{\pm 25}$

and the value of C is $0.00000386_{\pm 11}$.

Hence the value of F in equation (A) becomes $0.08993400_{\pm 43}$ gauss per ampere at 14°.0 C. The temperature corrections applied to the measured dimensions of the coil affect this constant below the seventh decimal place by 17.

Heating Effect of Current.

The deformation of the standard coil due to the heat by a current is tested by observing its dimensions before and during the flowing of a current of about 5 amperes. However, no change in diameter of the loops or in the axial distance between the mean planes of the loops is observed other than such as could be accounted for by the change in temperature of the room itself, as the wires are wound with sufficient tension.

Determination of the Constants of the Portable Helmholtz-Coils.

The electrical constants of the portable Helmholtz-Coils are determined by comparing them with the above determined constant of the standard coil. The instruments used are an Otto Wolff Co.'s potentiometer, a Weston standard cell by the Cambridge & Paul Instrument Co. and Leeds & Northrup Co.'s standard resistances of 0.1 and 100 ohms. During the comparison experiment, however, as the room temperature is ranging between 15°.5 and 16°.2 C., the temperature correction

for the constant of the marble standard coil is executed in the following manner : -

Differentiating (A) we get, as the variation of C is negligible,

$$\frac{dF}{F} = \frac{2l^2-a^2}{a^2+l^2}\frac{da}{a} - \frac{3l^2}{a^2+l^2}\frac{dl}{l} .$$

As the expansion coefficient α of the marble may be taken as equal in all directions, it becomes

$$\frac{da}{a} = \frac{dl}{l} = \alpha , \qquad \frac{dF}{F} = -\alpha .$$

Therefore $$F_t = F_{14}\{1 - \alpha(t-14.0)\},$$

where F_t and F_{14} represent the constants of the coil at the temperature t and 14°.0 C. respectively.

The applied correction affects the last two figures of each resulting value of the constant of the portable coil in Table 7 by about 4s , the effect of this for an observed result of holizontal intensity being 0.6 gamma at the most. Therefore the error in the horizontal intensity introduced by using the above assumption for the expansion of the marble will be negligible in the accuracy of one gamma at any rate. The determined constants of the portable coils are reduced to 20°C. as follows : —

Table 7.—Constants of the Portable Coils at 20°C. in gauss/amp.

P_{20}

Magnet-ometer / Coil	No. 3	No. 4	No. 5
A	$27.3330_0 \pm 12$	$27.3245_4 \pm 85$	$27.3282_6 \pm 48$
B	$27.3217_1 \pm 11$	$27.3345_6 \pm 70$	$27.3294_5 \pm 15$

In the calculations of the above results, the corrections for expansions of the portable coils are computed by the following formula, as all the coils are made of brass,

$$P_t = P_{20}\{1-0.000018_5(t-20)\},$$

where P_t and P_{20} are the constants of a portable coil at temperatures t and 20° C. respectively.

Determination of the Constants of the Current Standard Metres.

As the voltage of a standard cell and the resistance of a standard resistance wire change with temperature, the strength of electric current which is established by them should be changed with temperature accordingly.

Table 8. — Results of Measurements of the Current Intensities.

(unit is ampere)

Magnet-ometer No.	Resist.	R_1		R_2		R_3	
	Cell / Temp.	C_2	C_3	C_2	C_3	C_2	C_3
3	4.0	.....	.....	0.00765961	0.00766041	0.00562868	0.00562929
	4.1	0.01061177	0.01061287	.....	.....	.....	.....
	10.9	60861	60922	65728	65766	.....	.....
	11.0	.....	.....	.....	.....	62695	62728
	14.5	.....	.....	.....	.....	62591	62616
	14.8	.....	.....	65579	65604	.....	.....
	14.9	60634	60672	.....	.....	.....	.....
	20.3	60313	60317	.....	.....	.....	.....
	20.4	.....	.....	65334	65338	62406	62411
	25.3	60039	60034	65142	65139	62276	62270
	30.4	.....	.....	.....	.....	62108	62103
	30.5	59732	59725	64930	64922	.....	.....
	35.5	59350	59328	64795	64649	61905	61892
	40.1	58970	58945	64378	64362	.....	.....
	40.2	.....	.....	.....	.....	61696	61684
4	4.1	.....	.....	.....	.....	0.00562909	0.00562823
	4.2	0.01061200	0.01061039	0.00765999	0.00765882	.....	.....
	10.6	60800	60751	65691	65661	.....	.....
	10.8	.....	.....	.....	.....	62684	.....
	10.9	.....	.....	.....	.....	.....	62656
	14.5	.....	.....	65529	65519	62561	62561
	14.6	60571	60553	.....	.....	.....	.....
	20.4	.....	.....	.....	.....	62359	62380
	20.5	60188	60233	65250	65284	.....	.....
	25.3	59942	59974	65087	65087	62215	62235
	30.5	59608	59656	.....	.....	.....	.....
	30.6	.....	.....	64827	64862	62045	62068
	35.4	59302	59348	64599	64630	61876	61896
	40.2	58941	58983	64346	64380	61686	61710
5	4.0	0.01061257	0.01061224	0.00766024	0.00765981	0.00562895	0.00562868
	10.8	60977	60935	65844	65829	62756	62730
	14.2	.....	.....	.....	.....	62666	62651
	14.3	60786	60751	65713	65693	.....	.....
	20.3	60373	60345	65437	65416	62466	62454
	25.0	60073	60046	65231	65212	62310	62295
	30.4	59718	59694	64991	64972	62137	62123
	35.1	59310	59285	64703	64684	61927	61915
	40.2	58989	58970	64476	64472	61760	61749

Therefore it is necessary, in the determination of horizontal intensity of the earth's magnetism by the method described before, to have the values of the current in the portable Helmholtz-Coil for every temperature of the current standard meter.

The strength of the electric current established by each combination of the cell and the resistance in each current standard meter is standardized at several temperatures ranging from 4° to 40° C. The instruments used in this standardization are a potentiometer by the Otto Wolff Co., a Weston standard cell by the Cambridge & Paul Instrument Co. and a standard resistance by the Leeds & Northrup Co. The results of measurements obtained in March 1934 are as shown in Table 8.

Applying the formula $I_t = I_{20}\{1 + \alpha(t-20) + \beta(t-20)^2\}$, the values of the coefficients are computed by the method of least squares as follows: —

Table 9.— The current intensities established by the current standard meters at 20° C. and their temperature coefficients.

(unit is ampere)

Magnetometer No.	Resist.	Cell	$I_{20} \times 10^8$	$\alpha \times 10^8$	$\beta \times 10^9$
3	R_1	C_2	1060360 ± 25	− 5525	− 448
		C_3	1060373 ± 47	− 5912	− 337
	R_2	C_2	765382 ± 24	− 5274	− 392
		C_3	765383 ± 17	− 5828	− 325
	R_3	C_2	562438 ± 13	− 5474	− 473
		C_3	562445 ± 14	− 5881	− 356
4	R_1	C_2	1060249 ± 24	− 5768	− 113
		C_3	1060272 ± 19	− 5171	− 390
	R_2	C_2	765295 ± 15	− 5837	− 99
		C_3	765308 ± 7	− 5268	− 345
	R_3	C_2	562386 ± 34	− 5887	− 76
		C_3	562399 ± 10	− 5313	− 341
5	R_1	C_2	1060409 ± 31	− 5900	− 445
		C_3	1060378 ± 31	− 5855	− 439
	R_2	C_2	765462 ± 21	− 5547	− 486
		C_3	765442 ± 23	− 5458	− 504
	R_3	C_2	562481 ± 13	− 5518	− 480
		C_3	562464 ± 16	− 5444	− 500

In the above formula I_{20} and I_t represent the current intensities established by the current standard meter at 20° C. and t respectively, α and β being constants.

Field Intensity at the Centre of the Portable Helmholtz-Coil.

According to the former descriptions, the intensity H_t of magnetic field at the centre of the portable Helmholtz-Coil at t_c° C., generated by the current established by the current standard meter at t_s° is given by the following expression:

$$H_t = P_{20}\, I_{20}\{1 - 18_5 \times 10^{-7}(t_c - 20)\}\{1 + \alpha(t_s - 20) + \beta(t_s - 20)^2\}$$
$$= H_{20}\{1 + f(\Delta t_c)\}\{1 + g(\Delta t_s)\},$$

where $H_{20} = P_{20}\, I_{20}$, and Δt_c and Δt_s represent the temperature differences of the portable coil and the current standard meter from 20° C.

By the results in Tables 7 and 9, the value of H_{20} for each combination of a Helmholtz-Coil, a standard cell and a standard resistance becomes as follows: —

Table 10. — Field intensity at the centre of each coil produced by each established current at 20° C.

H_{20}

Magnetometer No.	Coil	Resist. / Cell	R_1	R_2	R_3
			Γ	Γ	Γ
3	A	C_2	0.289828 ± 7	0.209202 ± 7	0.153731 ± 4
		C_3	0.289832 ± 13	0.209202 ± 5	0.153733 ± 4
	B	C_2	0.289708 ± 7	0.209115 ± 7	0.153668 ± 4
		C_3	0.289712 ± 13	0.209116 ± 5	0.153670 ± 4
4	A	C_2	0.289708 ± 11	0.209113 ± 8	0.153669 ± 10
		C_3	0.289715 ± 10	0.209117 ± 7	0.153673 ± 6
	B	C_2	0.289814 ± 10	0.209190 ± 7	0.153726 ± 10
		C_3	0.289821 ± 9	0.209194 ± 6	0.153729 ± 5
5	A	C_2	0.289791 ± 10	0.209187 ± 7	0.153716 ± 4
		C_3	0.289783 ± 10	0.209182 ± 7	0.153712 ± 5
	B	C_2	0.289804 ± 9	0.209197 ± 6	0.153723 ± 4
		C_3	0.289795 ± 9	0.209191 ± 6	0.153718 ± 4

The value of $\log\{1+f(\Delta t_c)\}$ is common to all coils since they are constructed of the same material and the value corresponding to each degree of temperature is shown in Table 11. However, the value of $\log\{1+g(\Delta t_s)\}$ somewhat differs according to the instruments as known from Table 9, and its value for each degree of temperature of the current standard meter is given in Tables 12_b—14_b being represented by its logarithm.

Table 11.— Values of $\log\{1+f(\Delta t_c)\}$.

Temp.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
°										
0	0.000161	153	145	137	128	121	112	105	096	089
10	0.000080	072	064	056	048	040	032	024	016	008
20	0.000000	992	984	976	968	960	952	944	936	928
30	9.999920	911	904	895	888	879	872	863	855	847

The constants of the magnetometers represented by their logarithms are given in Tables 12a—14a separately for each of the magnetometers.

Table 12.

CONSTANTS OF MAGNETOMETER NO. 3.

a.—Field Intensity at the Center of Each Coil at 20° C.

$\log H_{20}$.

Coil	C \ R	R1	R2	R3
A	C2	9.462140	9.320566	9.186762
	C3	9.462146	9.320566	9.186767
B	C2	9.461960	9.320386	9.186583
	C3	9.461966	9.320388	9.186589

b.—Values of $\log\{1+g(\Delta t_s)\}$

Cell and Resist.	Temp.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
	°										
C2 R1	0	0.000402	386	369	352	334	316	297	279	260	241
	10	0.000220	200	179	159	137	115	093	070	047	024
	20	0.000000	−024	−049	−074	−099	−125	−151	−178	−205	−231
	30	−0.000259	−287	−316	−345	−374	−404	−434	−464	−495	−526
C2 R2	0	0.000390	373	357	340	323	305	287	269	251	231
	10	0.000212	192	172	152	131	110	089	067	045	023
	20	0.000000	−023	−046	−070	−094	−119	−143	−169	−194	−220
	30	−0.000246	−272	−299	−327	−354	−382	−410	−439	−467	−497
C2 R3	0	0.000393	377	361	345	328	311	292	274	256	237
	10	0.000217	198	177	156	135	114	092	069	046	024
	20	0.000000	−024	−048	−073	−099	−124	−150	−176	−203	−231
	30	−0.000258	−286	−315	−344	−373	−403	−433	−464	−494	−526
C3 R1	0	0.000436	417	399	380	361	341	321	301	280	259
	10	0.000237	215	193	170	147	124	099	075	050	026
	20	0.000000	−026	−052	−079	−106	−133	−161	−189	−218	−247
	30	−0.000276	−306	−336	−367	−398	−429	−461	−492	−525	−558
C3 R2	0	0.000450	430	410	390	369	348	327	305	283	261
	10	0.000239	217	193	170	147	123	099	075	050	025
	20	0.000000	−025	−051	−077	−103	−130	−157	−184	−211	−239
	30	−0.000268	−295	−324	−353	−382	−411	−441	−471	−501	−532
C3 R3	0	0.000449	429	410	390	369	348	327	306	284	262
	10	0.000240	217	194	172	148	124	099	075	051	026
	20	0.000000	−026	−052	−078	−105	−132	−159	−186	−214	−242
	30	−0.000271	−300	−329	−358	−388	−418	−448	−479	−510	−541

Table 13.

CONSTANTS OF MAGNETOMETER NO. 4.

a.—Field Intensity at the Center of Each Coil at 20° C.

log H_{20}.

Coil	C \ R	R_1	R_2	R_3
A	C_2	9.461961	9.320383	9.186589
	C_3	9.461971	9.320390	9.186597
B	C_2	9.462121	9.320541	9.186748
	C_3	9.462130	9.320549	9.186759

b.—Values of $\log\{1+g(\Delta t_s)\}$.

Cell and Resist.	Temp.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
C_2 R_1	°										
	0	0.000482	458	435	412	388	365	341	317	294	269
	10	0.000246	221	197	173	149	124	099	075	050	025
	20	0.000000	−025	−050	−076	−101	−126	−152	−178	−203	−229
	30	−0.000255	−281	−307	−334	−360	−387	−413	−440	−467	−494
C_2 R_2	0	0.000489	466	443	418	395	371	347	322	298	274
	10	0.000249	225	200	175	150	126	100	076	051	025
	20	0.000000	−025	−051	−076	−102	−128	−154	−180	−205	−231
	30	−0.000258	−284	−310	−337	−363	−390	−416	−443	−470	−497
C_2 R_3	0	0.000446	424	402	380	359	337	315	293	271	248
	10	0.000226	204	182	159	136	114	091	069	046	023
	20	0.000000	−023	−046	−069	−092	−116	−139	−162	−185	−209
	30	−0.000233	−256	−280	−304	−328	−352	−376	−400	−424	−448
C_3 R_1	0	0.000381	365	350	333	316	299	281	263	245	227
	10	0.000208	188	169	149	129	108	087	066	044	023
	20	0.000000	−023	−046	−069	−093	−117	−141	−165	−191	−216
	30	−0.000241	−268	−294	−321	−347	−375	−403	−431	−459	−488
C_3 R_2	0	0.000398	380	363	346	328	309	291	272	253	233
	10	0.000214	194	173	153	132	110	089	067	045	023
	20	0.000000	−023	−046	−070	−094	−118	−142	−168	−192	−218
	30	−0.000244	−270	−296	−323	−350	−377	−404	−433	−460	−489
C_3 R_3	0	0.000403	385	367	349	331	313	294	275	256	236
	10	0.000216	195	175	154	133	112	090	068	046	023
	20	0.000000	−023	−046	−070	−095	−119	−144	−169	−194	−220
	30	−0.000245	−271	−298	−325	−352	−380	−407	−435	−463	−492

Table 14.

CONSTANTS OF MAGNETOMETER NO. 5.

a.— Field Intensity at the Center of Each Coil at 20° C.

log H_{20}

Coil	C \ R	R_1	R_2	R_3
A	C_2	9.462086	9.320537	9.186719
	C_3	9.462073	9.320524	9.186708
B	C_2	9.462104	9.320556	9.186739
	C_3	9.462092	9.320543	9.186727

b.— Values of $\log\{1+g(\Delta t_s)\}$

Cell and Resist.	Temp.	0°	1°	2°	3°	4°	5°	6°	7°	8°	9°
C_2 R_1	°										
	0	0.000435	417	399	380	360	341	321	301	280	258
	10	0.000237	215	193	170	147	123	099	075	050	026
	20	0.000000	−026	−052	−079	−106	−133	−161	−189	−217	−246
	30	−0.000276	−305	−335	−366	−397	−428	−459	−492	−524	−557
C_2 R_2	0	0.000397	382	365	349	332	314	296	278	259	239
	10	0.000220	200	179	158	137	115	093	070	047	024
	20	0.000000	−024	−049	−074	−100	−126	−152	−179	−206	−234
	30	−0.000262	−291	−320	−349	−379	−409	−440	−470	−502	−534
C_2 R_3	0	0.000396	380	364	347	330	313	295	276	258	238
	10	0.000219	199	178	157	136	115	093	070	047	024
	20	0.000000	−024	−049	−074	−099	−125	−151	−178	−205	−233
	30	−0.000261	−289	−317	−347	−377	−406	−437	−468	−499	−530
C_3 R_1	0	0.000432	414	396	377	358	338	319	298	278	257
	10	0.000235	213	191	169	145	122	099	075	050	026
	20	0.000000	−026	−050	−078	−105	−132	−159	−188	−215	−245
	30	−0.000274	−303	−333	−363	−393	−424	−456	−487	−519	−552
C_3 R_2	0	0.000387	371	356	340	323	307	289	271	253	234
	10	0.000215	195	176	155	134	113	091	069	046	023
	20	0.000000	−024	−048	−073	−098	−124	−150	−177	−204	−231
	30	−0.000259	−287	−316	−345	−375	−405	−435	−466	−497	−529
C_3 R_3	0	0.000386	370	355	339	323	306	288	271	252	234
	10	0.000215	195	175	155	134	112	091	069	046	023
	20	0.000000	−024	−048	−073	−098	−124	−150	−176	−203	−231
	30	−0.000258	−287	−315	−344	−373	−404	−434	−465	−496	−528

CONSTANTS ADOPTED.

The determinations of the constants described in the last paragraphs are those carried out after this survey. Besides these determinations, the constants are measured before this survey, too, by just the same method as described before. The results are as in Table 15, but the values of $\log\{1+g(\Delta t_s)\}$ determined at that time are omitted, as they are the same as those in Table 12—14.

Table 15.—Constants $\log H_{20}$ of the magnetometers determined at the beginning of the survey.

Magnetometer No.	Coil	Resist. / Cell	R_1	R_2	R_3
3	A	C_2	9.462230	9.320663	9.186841
		C_3	9.462245	9.320680	9.186861
	B	C_2	9.462395	9.320828	9.187006
		C_3	9.462410	9.320845	9.187026
4	A	C_2	9.461863	9.320304	9.186497
		C_3	9.461885	9.320328	9.186507
	B	C_2	9.462092	9.320533	9.186726
		C_3	9.462114	9.320557	9.186736
5	A	C_2	9.462054	9.32053r	9.186664
		C_3	9.462050	9.320530	9.186659
	B	C_2	9.461975	9.320452	9.186585
		C_3	9.461971	9.320451	9.186580

The coil B of the magnetometer No. 3 was rewound in the middle of this survey and its electrical constant has naturally changed.

Comparing the two corresponding results obtained by the respective determinations, it is known that the constants of the magnetometers are not much changed merely with lapse of time of about two years in the period of this survey; the greatest change of them affects the observed value of horizontal intensity by 10 gammas.

In the recomputations of observed results in the office, the constants in Tables 12—14 are adopted for the results obtained in the year 1933 and the constants determined before this survey are adopted only for the results in 1932, though the latter have been provisionally employed throughout this survey for field computations. However, in the final results of observations in Table 28, the effect of the change of the constant are eliminated, since they are corrected by determining the instrumental corrections three times (at the beginning, middle and end of this survey) as will be described in the latter paragraphs.

COMPARISON OF THE INSTRUMENTS.

All the magnetometers used (except the Kew Magnetometer No. 12) were compared three times in this magnetic survey at the Kakioka Magnetic Observatory. The corrections of each magnetometer on the International Magnetic Standards (I.M.S.) were computed by applying the relations between the Kakioka Magnetic Standards (K.M.S.) and I.M.S. to the results of the comparison of K.M.S. with our's. The first comparison was carried out directly before the commencement of this survey, on February 17-20, 1932, the second nearly in the middle, on November 26-29, 1932, and the third immediately after the completion of this survey, on November 25-0, 1933, at the hill situated to the south of the absolute house of the Observatory by the same method as described in the "Bulletin of the Hydrographic Department, Vol. V".

The five stations, which are named A, B, C, D and E, are selected separating greater than 13 meters each other and their situations are marked by the wooden posts. At the centre of the top of each post, an index is attached with which the centre line of a magnetometer-theodolite is to be made coincidence, and every comparison observation is made at three or more of these stations. The magnetic locality of the station B with respect to the absolute house of the observatory was determined on February 19-20, 1932 by the simultaneous observations with the magnetometers No. 3 and No. 5. The observations were made by setting the magnetometer No. 5 at the station B and then on the stone stand in the absolute house successively, while the magnetometer No. 3 was remaining at the station A. If the results obtained with the magnetometer No. 5 in the absolute house are compared with the corresponding values given by the variometer of the Observatory, the instrumental corrections of the magnetometer on K.M.S. are directly determined. For, the variometer value is referred to K.M.S. in the absolute house. The results of these observations and those of all comparison observations are given in Tables 16—19 with the variometer values.

Besides the comparison observations at Kakioka, the magnetometer No. 5 was compared with the variometer values of the Toyohara Observatory in September 1932, by A. Muramoto and S. Urai, when they visited the Observatory and these results are as in Table 20. However, these are not employed for the calculation of the magnetometer corrections.

Table 16.

RESULTS OF OBSERVATIONS IN COMPARISONS OF MAGNETOMETER NO. 5 WITH KAKIOKA MAGNETIC STANDARD, Feb. 1932.

Declination

Date and Time / Inst. and Station	Variometer (Variation House)	Magnetometer No. 3 (A Station)			Magnetometer No. 4 (D Station)			Magnetometer No. 5 (Absolute House)		
	Dec.	Coil	Mag.	Dec.	Coil	Mag.	Dec.	Coil	Mag.	Dec.
th h m	° ′			° ′			° ′			° ′
19 16 57.4	5 45.0	B	A	5 44.5	A	A	5 41.9	A	A	5 42.3
19 17 08.7	5 44.4	B	A	5 44.2	A	A	5 41.9	A	A	5 42.2
19 17 15.6	5 44.4	B	A	5 44.4	A	A	5 41.8	A	A	5 42.1
20 11 05.2	5 43.0	B	A	5 42.2	A	A	5 40.2	A	A	5 40.6
20 11 14.5	5 43.1	B	A	5 42.5	A	A	5 40.4	A	A	5 40.9
20 11 22.9	5 43.3	B	A	5 42.7	A	A	5 40.5	A	A	5 41.0
20 14 49.5	5 43.9	B	A	5 43.2	A	A	5 41.5	A	A	5 41.4
20 15 02.1	5 43.5	B	A	5 43.2	A	A	5 41.4	A	A	5 41.2
20 15 11.0	5 43.2	B	A	5 42.9	A	A	5 41.1	A	A	5 41.0

Dip

Date and Time / Inst. and Station	Variometer (Variation House)	Magnetometer No. 3 (A Station)	Magnetometer No. 4 (D Station)	Magnetometer No. 5 (Absolute House)
	Dip	Dip	Dip	Dip
th h m	° ′	° ′	° ′	° ′
20 10 07.7	49 26.9	49 27.1	49 27.4	49 25.6
20 10 15.9	49 27.0	49 27.2	49 27.9	49 25.8
20 10 22.7	49 26.9	49 27.3	49 28.0	49 25.6

Horizontal Intensity

Date and Time / Inst. and Station	Variometer (Variation House)	Magnetometer No. 3 (A Station)					Magnetometer No. 4 (D Station)					Magnetometer No. 5 (Absolute House)				
	Hor.	Coil	Mag.	C	R	Hor.	Coil	Mag.	C	R	Hor.	Coil	Mag.	C	R	Hor.
th h m	γ					γ					γ					γ
20 11 57.2	29750	B	A	2	2	29750	A	A	2	2	29738	A	A	2	2	29750
20 12 17.3	29750	B	A	2	2	29751	A	A	2	2	29742	A	A	2	2	29752
20 12 28.3	29751	B	A	2	2	29753	A	A	2	2	29740	A	A	2	2	29755
20 13 49.7	29748	B	A	2	2	29750	A	A	2	2	29738	A	A	2	2	29750
20 14 01.3	29741	B	A	2	2	29743	A	A	2	2	29735	A	A	2	2	29744
20 14 14.7	29736	B	A	2	2	29735	A	A	2	2	28725	A	A	2	2	29737

Table 17.

RESULTS OF OBSERVATIONS IN COMPARISONS OF THE INSTRUMENTS AT KAKIOKA, Feb. 1932.

Declination

Date and Time / Inst. and Station	Variometer (Variation House)	Magnetometer No. 3				Magnetometer No. 4				Magnetometer No. 5			
	Dec.	Station	Coil	Mag.	Dec.	Station	Coil	Mag.	Dec.	Station	Coil	Mag.	Dec.
th h m	° ′				° ′				° ′				° ′
17 10 51.9	5 41.5	C	B	A	5 40.5	B	A	A	5 41.3	A	A	A	5 39.8
17 17 31.4	5 44.1	C	A	A	5 43.3	B	B	A	5 44.2	A	B	A	5 42.9
18 11 00.1	5 42.0	B	B	A	5 41.5	A	A	A	5 41.0	C	A	A	5 40.5
18 14 23.0	5 44.2	B	B	B	5 44.0	A	A	B	5 43.9	C	A	B	5 43.4
18 15 05.5	5 44.3	B	B	C	5 43.8	A	A	C	5 43.9	C	A	C	5 43.2
19 9 18.5	5 42.2	A	B	A	5 42.0	C	A	A	5 41.3	B	A	A	5 40.9

Dip

Date and Time / Inst. and Station	Variometer (Variation House)	Magnetometer No. 3		Magnetometer No. 4		Magnetometer No. 5	
	Dip	Station	Dip	Station	Dip	Station	Dip
th h m	° ′		° ′		° ′		° ′
18 9 19.3	49 27.6	C	49 27.7	B	49 26.6	A	49 25.5
18 15 55.7	49 27.9	B	49 28.2	A	49 28.6	C	49 28.1
18 17 14.4	49 28.0	A	49 28.6	C	49 28.0	B	49 27.6

Horizontal Intensity

Date and Time / Inst. and Station	Variometer (Variation House)	Magnetometer No. 3					Magnetometer No. 4					Magnetometer No. 5				
	Hor.	Station	Coil	Mag.	C	R	Hor.	Station	Coil	Mag.	C	R	Hor.	Station	Coil	Mag.	C	R	Hor.
th h m	γ						γ						γ						γ
17 13 35.7	29710	C	B	A	2	2	29709	B	A	A	2	2	29704	A	A	A	2	2	29691
17 15 25.6	29719	C	A	A	2	2	29713	B	B	A	2	2	29703						·····
17 16 38.4	29724	C	A	A	2	2	29718	B	B	A	2	2	29709	A	B	A	2	2	29686
18 12 30.2	29729	B	B	A	2	2	29728	A	A	A	2	2	29721	C	A	A	2	2	29718
19 10 05.7	29742	A	B	A	2	2	29744	C	A	A	2	2	29753	B	A	A	2	2	29736
19 11 09.4	29739	A	B	A	2	3	29735	C	A	A	2	3	29742	B	A	A	2	3	29723
19 12 12.6	29724	A	A	A	2	2	29717	C	B	A	2	2	29728	B	B	A	2	2	29697

Kew Magnetometer No. 11 and Barrow's Dip Circle No. 3.

Declination				Dip				Horizontal Intensity			
Date and Time	Variometer (Variation House)	Mag. No. 11 Station	Mag. No. 11 Dec.	Date and Time	Variometer (Variation House)	D. C. No. 3 Station	D. C. No. 3 Dip	Date and Time	Variometer (Variation House)	Mag. No. 11 Station	Mag. No. 11 Hor.
th h m	° ′		° ′	th h m	° ′		° ′	th h m	γ		γ
18 11 31.3	5 42.4	D	5 41.8	18 13 51.3	49 27.8	D	49 28.8	18 2 56.4	29721	D	29622
20 2 10.7	5 43.9	B	5 45.8	20 10 07.7	49 26.9	B	49 27.0	20 13 12.7	29745	B	29678

Table 18.

RESULTS OF OBSERVATIONS IN COMPARISONS OF THE INSTRUMENTS AT KAKIOKA, Nov. 1932.

Declination

Date and Time	Variometer (Variation House)	Magnetometer No. 3				Magnetometer No. 4				Magnetometer No. 5				Magnetometer No. 6			
	Dec.	Station	Coil	Mag.	Dec.	Station	Coil	Mag.	Dec.	Station	Coil	Mag.	Dec.	Station	Coil	Mag.	Dec.
th h m	° ′				° ′				° ′				° ′				° ′
26 9 23.3	5 43.7	A	A	A	5 34.4*	E	A	A	5 44.5	C	A	A	5 41.2	B	A	A	5 43.9
26 10 05.6	5 43.9	A	B	A	5 34.6*	E	B	A	5 44.3	C	B	A	5 41.4	B	B	A	5 44.2
26 11 44.5	5 44.7	A	A	C	5 44.2	E	A	C	5 44.7	C	A	C	5 43.4	B	A	C	5 46.9
26 12 10.5	5 44.9	A	B	C	5 44.3	E	B	C	5 44.6	C	B	C	5 43.4	B	B	C	5 47.1
26 14 08.9	5 44.8	A	B	B	5 44.2	E	B	B	5 45.8	C	B	B	5 43.4	B	B	B	5 48.2
26 44 43.7	5 44.7	A	A	B	5 44.0	E	A	B	5 45.1	C	A	B	5 43.1	B	A	B	5 47.6
27 11 33.7	5 44.7	E	A	B	5 45.4	B	A	B	5 44.7	A	A	B	5 42.7	C	A	B	5 45.8
27 11 56.8	5 44.9	E	B	B	5 45.8	B	B	B	5 44.9	A	B	B	5 42.9	C	B	B	5 46.8
27 12 20.2	5 45.2	E	B	C	5 46.2	B	B	C	5 44.0	A	B	C	5 42.5	C	B	C	5 46.3
27 14 44.2	5 44.8	E	A	C	5 46.1	B	A	C	5 43.9	A	A	C	5 42.3	C	A	C	5 45.8
27 15 17.0	5 44.7	E	A	A	5 45.4	B	A	A	5 44.5	A	A	A	5 41.8	C	A	A	5 43.1
27 15 39.8	5 44.4	E	B	A	5 44.6	B	B	A	5 44.0	A	B	A	5 41.7	C	B	A	5 43.2
28 9 07.5	5 43.5	B	A	A	5 42.8	C	A	A	5 43.3	E	A	A	5 42.0	A	A	A	5 42.3
28 9 37.8	5 43.6	B	B	A	5 42.6	C	B	A	5 43.4	E	B	A	5 41.9	A	B	A	5 42.6
28 10 05.1	5 43.8	B	B	B	5 43.7	C	B	B	5 43.7	E	B	B	5 44.5	A	B	B	5 45.8
28 10 39.2	5 43.9	B	A	B	5 44.0	C	A	B	5 43.8	E	A	B	5 44.6	A	A	B	5 45.7
28 11 31.7	5 44.7	B	A	C	5 44.9	C	A	C	5 43.4	E	A	C	5 43.5	A	A	C	5 45.9
28 11 51.6	5 45.0	B	B	C	5 45.2	C	B	C	5 43.9	E	B	C	5 44.0	A	B	C	5 46.5
29 10 00.1	5 43.8	C	A	A	5 42.9	A	A	A	5 42.8	B	A	A	5 41.5	E	A	A	5 44.1
29 10 22.9	5 44.1	C	B	A	5 43.7	A	B	A	5 43.4	B	B	A	5 41.9	E	B	A	5 44.7
29 10 53.4	5 44.1	C	B	B	5 44.2	A	B	B	5 43.4	B	B	B	5 43.9	E	B	B	5 47.3
29 11 47.1	5 45.5	C	A	B	5 45.5	A	A	B	5 44.8	B	A	B	5 45.2	E	A	B	5 49.0
29 12 12.3	5 45.5	C	A	C	5 45.9	A	A	C	5 44.2	B	A	C	5 43.7	E	A	C	5 47.2
29 12 37.0	5 45.9	C	B	C	5 46.0	A	B	C	5 44.3	B	B	C	5 44.0	E	B	C	5 47.4

* is not employed in the computation.

Dip

Date and Time	Variometer (Variation House)	Magnetometer No. 3		Magnetometer No. 4		Magnetometer No. 5		Magnetometer No. 6	
	Dip	Station	Dip	Station	Dip	Station	Dip	Station	Dip
th h m	° ′		° ′		° ′		° ′		° ′
26 15 38.4	49 29.0	A	49 29.8	E	49 28.3	C	49 28.6	B	49 28.5
27 18 02.5	49 28.7	E	49 29.0	B	49 29.4	A	49 29.7	C	49 28.2
28 13 47.9	49 27.9	B	49 28.6	C	49 27.4	E	49 27.7	A	49 28.4
29 14 25.3	49 27.7	C	49 28.4	A	49 29.0	B	49 28.0	E	49 27.6

Table 18.

RESULTS OF OBSERVATIONS IN COMPARISONS OF THE INSTRUMENTS AT KAKIOKA, Nov. 1932—Continued.

Horizontal Intensity

Date and Time	Variometer (Variation House)	Magnetometer No. 3						Magnetometer No. 4						Magnetometer No. 5						Magnetometer No. 6					
	Hor.	Station	Coil	Mag.	C	R	Hor.	Station	Coil	Mag.	C	R	Hor.	Station	Coil	Mag.	C	R	Hor.	Station	Coil	Mag.	C	R	Hor.
th h m	γ						γ						γ						γ						γ
26 17 02.0	29717	A	A	B	2	1	29715	E	A	C	2	1	29712	C	A	C	2	1	29707	B	A	C	2	1	29722
27 9 58.2	29736	A	B	B	2	1	29723	E	B	C	2	1	29727	C	B	C	2	1	29716	B	B	C	2	1	29734
28 14 52.1	29739	B	A	B	2	1	29733	C	A	C	2	1	29735	E	A	C	2	1	29719	A	A	C	2	1	29739
28 15 41.2	29732	B	B	B	2	1	29722	C	B	C	2	1	29728	E	B	C	2	1	29708	A	B	C	2	1	29725
28 18 36.5	29718	E	A	B	2	1	29712	B	A	C	2	1	29714	A	A	C	2	1	29701	C	A	C	2	1	29728
28 19 57.7	29721	E	B	B	2	1	29710	B	B	C	2	1	29716	A	B	C	2	1	29700	C	B	C	2	1	29725
29 15 12.5	29753	C	A	B	2	1	29749	A	A	C	2	1	29742	B	A	C	2	1	29735	E	A	C	2	1	29753
29 15 39.5	29745	C	A	B	2	1	29741	A	A	C	2	2	29734	B	A	C	2	2	29726	E	A	C	2	2	29746
29 16 35.4	29726	C	B	B	2	1	29716	A	B	C	2	1	29716	B	B	C	2	1	29704	E	B	C	2	1	29715

Table 19.

RESULTS OF OBSERVATIONS IN COMPARISONS OF THE INSTRUMENTS AT KAKIOKA, Nov. 1933.

Declination

Date and Time	Variometer (Variation House)	Magnetometer No. 3				Magnetometer No. 4				Magnetometer No. 5			
	Dec.	Station	Coil	Mag.	Dec.	Station	Coil	Mag.	Dec.	Station	Coil	Mag.	Dec.
th h m	° ′				° ′				° ′				° ′
29 8 00.3	5 45.4	A	A	A	5 45.9	B	A	C	5 45.9	C	A	C	5 43.7
29 9 13.7	5 45.7	A	A	A	5 45.9	B	A	A	5 46.8	C	A	A	5 44.4
29 10 28.8	5 46.8	A	A	A	5 46.9	B	A	B	5 46.2	C	A	B	5 44.8
29 12 20.0	5 47.6	A	A	A	5 47.9	B	B	B	5 47.4	C	B	B	5 45.8
29 13 24.7	5 46.9	A	A	A	5 47.2	B	B	A	5 48.1	C	B	A	5 45.8
29 14 39.9	5 46.6	A	A	A	5 47.1	B	B	C	5 47.4	C	B	C	5 45.3
26 14 36.0	5 46.4	A	A	A	5 47.1	B	A	C	5 45.7	C	A	C	5 45.0
28 10 34.7	5 46.7	A	B	A	5 46.7	B	A	C	5 46.9	C	B	C	5 45.6
28 12 43.4	5 46.9	A	B	C	5 46.9	B	A	C	5 47.1	C	B	A	5 45.9
28 14 08.9	5 46.2	A	B	B	5 46.3	B	A	C	5 46.8	C	B	B	5 44.3
30 7 45.9	5 45.4	A	A	B	5 45.5	B	A	C	5 46.2	C	A	A	5 44.1
30 10 28.3	5 45.7	A	A	C	5 47.1	B	A	C	5 46.1	C	A	B	5 44.0
27 9 01.0	5 45.4	A	A	C	5 45.5	B	A	C	5 45.4	C	A	C	5 43.6
27 10 47.4	5 47.1	A	A	B	5 47.1	B	A	B	5 46.4	C	A	C	5 45.0
27 13 18.7	5 47.1	A	A	A	5 47.1	B	A	A	5 47.9	C	A	C	5 45.3
27 14 41.8	5 46.1	A	B	A	5 45.9	B	B	A	5 46.9	C	A	C	5 44.1
28 7 51.1	5 46.3	A	B	B	5 46.0	B	B	B	5 45.8	C	A	C	5 44.8
28 9 17.0	5 47.3	A	B	C	5 46.7	B	B	C	5 47.3	C	A	C	5 45.7

Table 19.

RESULTS OF OBSERVATIONS IN COMPARISONS OF THE INSTRUMENTS AT KAKIOKA, Nov. 1933 – Continued.

Declination

Date and Time			Inst. and Station: Variometer (Variation House) Dec.	Magnetometer No. 3 Station	Coil	Mag.	Dec.	Magnetometer No. 4 Station	Coil	Mag.	Dec.	Magnetometer No. 5 Station	Coil	Mag.	Dec.
th	h	m	° ′				° ′				° ′				° ′
25	8	25.2	5 44.9	A	A	B	5 44.9	B	A	B	5 44.2	C	A	B	5 42.8
25	10	18.6	5 46.4	A	A	A	5 46.9	B	A	C	5 45.4	C	A	C	5 45.5
25	13	55.3	5 46.1	B	A	B	5 46.0	C	A	B	5 45.3	A	A	B	5 44.6
25	15	11.6	5 45.7	B	A	A	5 46.3	C	A	C	5 44.3	A	A	C	5 44.6
26	9	03.2	5 45.7	C	A	B	5 45.2	A	A	B	5 45.4	B	A	B	5 43.7
26	10	12.8	5 46.5	C	A	A	5 46.8	A	A	C	5 45.6	B	A	C	5 45.5
29	8	00.3	5 45.4	A	A	A	5 45.9	B	A	C	5 45.9	C	A	C	5 43.7
30	13	54.3	5 45.8	B	A	A	5 46.1	C	A	C	5 45.7	A	A	C	5 44.9
30	15	34.4	5 45.6	C	A	A	5 45.4	A	A	C	5 46.1	B	A	C	5 44.3

Dip

Date and Time			Inst. and Station: Variometer (Variation House) Dip		Magnetometer No. 3 Station	Dip		Magnetometer No. 4 Station	Dip		Magnetometer No. 5 Station	Dip	
th	h	m	°	′		°	′		°	′		°	′
25	11	45.7	49	29.5	A	49	31.9	B	49	31.4	C	49	30.6
25	16	33.9	49	28.8	B	49	30.0	C	49	29.9	A	49	30.0
26	12	22.9	49	28.9	C	49	30.3	A	49	31.4	B	49	30.3
29	16	16.9	49	31.5	A	49	30.5	B	49	30.6	C	49	30.7
30	14	45.0	49	29.3	B	49	30.3	C	49	30.0	A	49	30.6
30	16	25.9	49	29.2	C	49	29.8	A	49	31.1	B	49	29.9

Horizontal Intensity

Date and Time			Inst. and Station: Variometer (Variation House) Hor.	Magnetometer No. 3 Station	Coil	Mag.	C	R	Hor.	Magnetometer No. 4 Station	Coil	Mag.	C	R	Hor.	Magnetometer No. 5 Station	Coil	Mag.	C	R	Hor.
th	h	m	γ						γ						γ						γ
29	8	23.1	29718	A	A	A	2	2	29712	B	A	C	2	2	29720	C	A	C	2	2	29715
29	8	24.8	29718	A	A	A	2	2	29713	B	A	C	3	2	29716	C	A	C	3	2	29716
29	8	43.6	29718	A	A	A	2	2	29711	B	A	C	2	1	29720	C	A	C	2	1	29717
29	8	45.5	29718	A	A	A	2	2	29712	B	A	C	3	1	29717	C	A	C	3	1	29716
29	9	34.5	29720	A	A	A	2	2	29714	B	A	A	2	2	29722	C	A	A	2	2	29717
29	9	35.9	29720	A	A	A	2	2	29714	B	A	A	3	2	29718	C	A	A	3	2	29716
29	10	04.1	29718	A	A	A	2	2	29713	B	A	A	2	1	29719	C	A	A	2	1	29717
29	10	05.7	29717	A	A	A	2	2	29714	B	A	A	3	1	29716	C	A	A	3	1	29716

Table 19.

RESULTS OF OBSERVATIONS IN COMPARISONS OF THE INSTRUMENTS AT KAKIOKA, Nov. 1933—Continued.

Horizontal Intensity

Date and Time			Inst. and Station: Variometer (Variation House) Hor.	Magnetometer No. 3 Station	Coil	Mag.	C	R	Hor.	Magnetometer No. 4 Station	Coil	Mag.	C	R	Hor.	Magnetometer No. 5 Station	Coil	Mag.	C	R	Hor.
th	h	m	γ						γ						γ						γ
29	10	48.5	29714	A	A	A	2	2	29707	B	A	B	2	2	29717	C	A	B	2	2	29714
29	10	50.3	29715	A	A	A	2	2	29709	B	A	B	3	2	29714	C	A	B	3	2	29711
29	11	11.2	29717	A	A	A	2	2	29710	B	A	B	2	1	29718	C	A	B	2	1	29717
29	11	12.7	29717	A	A	A	2	2	29712	B	A	B	3	1	29716	C	A	B	3	1	29716
29	12	36.6	29715	A	A	A	2	2	29710	B	B	B	2	2	29716	C	B	B	2	2	29707
29	12	38.3	29715	A	A	A	2	2	29710	B	B	B	3	2	29713	C	B	B	3	2	29706
29	12	56.3	29718	A	A	A	2	2	29714	B	B	B	2	1	29716	C	B	B	2	1	29715
29	12	58.0	29718	A	A	A	2	2	29714	B	B	B	3	1	29714	C	B	B	3	1	29715
29	13	43.4	29721	A	A	A	2	2	29716	B	B	A	2	2	29719	C	B	A	2	2	29718
29	13	45.0	29721	A	A	A	2	2	29716	B	B	A	3	2	29717	C	B	A	3	2	29717
29	14	01.8	29721	A	A	A	2	2	29716	B	B	A	2	1	29721	C	B	A	2	1	29719
29	14	03.5	29721	A	A	A	2	2	29716	B	B	A	3	1	29718	C	B	A	3	1	29719
29	14	57.4	29722	A	A	A	2	2	29717	B	B	C	2	2	29721	C	B	C	2	2	29718
29	14	58.9	29721	A	A	A	2	2	29717	B	B	C	3	2	29717	C	B	C	3	2	29718
29	15	16.7	29719	A	A	A	2	2	29715	B	B	C	2	1	29718	C	B	C	2	1	29717
29	15	18.9	29719	A	A	A	2	2	29714	B	B	C	3	1	29715	C	B	C	3	1	29717
26	15	15.3	29726	A	A	A	2	2	29723	B	A	C	2	2	29729	C	A	C	2	2	29729
26	15	17.3	29726	A	A	A	3	2	29723	B	A	C	2	2	29730	C	A	C	3	2	29728
26	16	06.8	29728	A	A	A	2	1	29726	B	A	C	2	2	29730	C	A	C	2	1	29731
26	16	09.3	29728	A	A	A	3	1	29726	B	A	C	2	2	29730	C	A	C	3	1	29730
30	10	53.1	29712	A	A	C	2	2	29706	B	A	C	2	2	29713	C	A	B	2	2	29709
30	10	55.5	29711	A	A	C	3	2	29707	B	A	C	2	2	29714	C	A	B	3	2	29710
30	11	15.9	29712	A	A	C	2	1	29710	B	A	C	2	2	29713	C	A	B	2	1	29712
30	11	17.5	29712	A	A	C	3	1	29710	B	A	C	2	2	29714	C	A	B	3	1	29712
30	12	39.4	29714	A	A	B	2	2	29708	B	A	C	2	2	29715	C	A	A	2	2	29711
30	12	41.1	29714	A	A	B	3	2	29709	B	A	C	2	2	29716	C	A	A	3	2	29710
30	12	57.4	29714	A	A	B	2	1	29711	B	A	C	2	2	29715	C	A	A	2	1	29713
30	12	59.0	29714	A	A	B	3	1	29712	B	A	C	2	2	29715	C	A	A	3	1	29713
28	10	57.8	29687	A	B	A	2	2	29691	B	A	C	2	2	29697	C	B	C	2	2	29695
28	10	59.6	29687	A	B	A	3	2	29689	B	A	C	2	2	29698	C	B	C	3	2	29691
28	11	20.9	29689	A	B	A	2	1	29693	B	A	C	2	2	29697	C	B	C	2	1	29693
28	11	22.9	29689	A	B	A	3	1	29693	B	A	C	2	2	29697	C	B	C	3	1	29692
28	13	19.5	29696	A	B	C	2	2	29699	B	A	C	2	2	29703	C	B	A	2	2	29699
28	13	21.1	29696	A	B	C	3	2	29700	B	A	C	2	2	29704	C	B	A	3	2	29699
28	13	39.6	29697	A	B	C	2	1	29702	B	A	C	2	2	29705	C	B	A	2	1	29701
28	13	41.2	29697	A	B	C	3	1	29702	B	A	C	2	2	29705	C	B	A	3	1	29701

Table 19.

RESULTS OF OBSERVATIONS IN COMPARISONS OF THE INSTRUMENTS AT KAKIOKA, Nov. 1933—Continued.

Horizontal Intensity

Date and Time			Variometer (Variation House)	Magnetometer No. 3						Magnetometer No. 4						Magnetometer No. 5					
				Station	Coil	Mag.	C	R	Hor.	Station	Coil	Mag.	C	R	Hor.	Station	Coil	Mag.	C	R	Hor.
th	h	m	γ						γ						γ						γ
28	14	39.0	29703	A	B	B	2	2	29705	B	A	C	2	2	29710	C	B	B	2	2	29706
28	14	40.9	29703	A	B	B	3	2	29706	B	A	C	2	2	29710	C	B	B	3	2	29703
28	14	59.9	29703	A	B	B	2	1	29707	B	A	C	2	2	29712	C	B	B	2	1	29707
28	15	01.7	29703	A	B	B	3	1	29708	B	A	C	2	2	29711	C	B	B	3	1	29707
27	9	43.2	29713	A	A	C	2	2	29708	B	A	C	2	2	29718	C	A	C	2	2	29717
27	9	40.3	29713	A	A	C	3	2	29707	B	A	C	3	2	29716	C	A	C	2	2	29718
27	10	10.1	29708	A	A	C	2	1	29704	B	A	C	2	1	29715	C	A	C	2	2	29713
27	10	11.9	29708	A	A	C	3	1	29704	B	A	C	3	1	29714	C	A	C	2	2	29712
27	11	18.2	29707	A	A	B	2	2	29705	B	A	B	2	2	29715	C	A	C	2	2	29712
27	11	20.0	29707	A	A	B	3	2	29705	B	A	B	3	2	29713	C	A	C	2	2	29712
27	11	46.6	29707	A	A	B	2	1	29706	B	A	B	2	1	29715	C	A	C	2	2	29713
27	11	48.5	29707	A	A	B	3	1	29707	B	A	B	3	1	29713	C	A	C	2	2	29713
27	13	44.0	29720	A	A	A	2	2	29721	B	A	A	2	2	29726	C	A	C	2	2	29723
27	13	45.8	29720	A	A	A	3	2	29718	B	A	A	3	2	29725	C	A	C	2	2	29726
27	14	10.5	29721	A	A	A	2	1	29722	B	A	A	2	1	29728	C	A	C	2	2	29728
27	14	12.1	29721	A	A	A	3	1	29720	B	A	A	3	1	29728	C	A	C	2	2	29727
27	15	05.2	29723	A	B	A	2	2	29724	B	B	A	2	2	29725	C	A	C	2	2	29728
27	15	06.7	29723	A	B	A	3	2	29723	B	B	A	3	2	29724	C	A	C	2	2	29728
27	15	33.1	29723	A	B	A	2	1	29723	B	B	A	2	1	29725	C	A	C	2	2	29726
27	15	34.7	29723	A	B	A	3	1	29722	B	B	A	3	1	29724	C	A	C	2	2	29727
28	8	15.4	29706	A	B	B	2	2	29708	B	B	B	2	2	29712	C	A	C	2	2	29712
28	8	17.4	29705	A	B	B	3	2	29707	B	B	B	3	2	29711	C	A	C	2	2	29711
28	8	37.1	29702	A	B	B	2	1	29706	B	B	B	2	1	29707	C	A	C	2	2	29708
28	8	38.8	29702	A	B	B	3	1	29706	B	B	B	3	1	29707	C	A	C	2	2	79708
28	9	38.4	29698	A	B	C	2	2	29700	B	B	C	2	2	29704	C	A	C	2	2	29703
28	9	40.3	29698	A	B	C	3	2	29700	B	B	C	3	2	29702	C	A	C	2	2	29702
28	9	57.8	29695	A	B	C	2	1	29699	B	B	C	2	1	29702	C	A	C	2	2	29702
28	9	59.5	29695	A	B	C	3	1	29698	B	B	C	3	1	29700	C	A	C	2	2	29701
25	9	08.9	29711	A	A	B	2	2	29709	B	A	B	2	2	29714	C	A	B	2	2	29715
25	10	41.7	29706	A	A	A	2	2	29705	B	A	C	2	2	29709	C	A	C	2	2	29712
25	14	24.6	29721	B	A	B	2	2	29722	C	A	B	2	2	29726	A	A	B	2	2	29721
25	15	51.9	29725	B	A	A	2	2	29725	C	A	C	2	2	29732	A	A	C	2	2	29723
26	9	32.0	29722	C	A	B	2	2	29725	A	A	B	2	2	29721	B	A	B	2	2	29721
26	11	27.4	29720	C	A	A	2	2	29724	A	A	C	2	2	29720	B	A	C	2	2	29719
29	8	23.1	29718	A	A	A	2	2	29712	B	A	C	2	2	29720	C	A	C	2	2	29715
30	14	18.4	29719	B	A	A	2	2	29718	C	A	C	2	2	29722	A	A	C	2	2	29711
30	15	56.5	29720	C	A	A	2	2	29719	A	A	C	2	2	29720	B	A	C	2	2	29716

Table. 20

RESULTS OF COMPARISON OBSERVATIONS AT TOYOHARA—Sept. 1932.

Declination Coil A, Mag. C

Date and Time			Variometer	Magnetometer No. 5	Date and Time			Variometer	Magnetometer No. 5	Date and Time			Variometer	Magnetometer No. 5
th	h	m	° ′	° ′	th	h	m	° ′	° ′	st	h	m	° ′	° ′
20	12	57.6	8 57.8	8 56.3	20	18	20.3	8 53.6	8 50.9	21	10	31.0	8 55.5	8 53.1
20	12	59.3	8 57.8	8 55.7	20	18	27.3	8 53.3	8 50.7	21	10	57.7	8 55.7	8 53.2
20	13	02.3	8 57.7	8 55.7	20	18	48.8	8 54.0	8 51.4	21	11	00.6	8 55.7	8 53.3
20	13	57.5	8 57.8	8 55.9	20	18	50.3	8 54.0	8 51.4	21	11	15.3	8 56.1	8 53.6
20	14	00.3	8 57.6	8 55.8	20	18	55.3	8 54.1	8 51.5	21	11	37.8	8 56.3	8 54.2
20	14	57.0	8 56.0	8 54.0	20	19	00.4	8 54.1	8 51.4	21	11	57.2	8 56.4	8 54.0
20	15	00.2	8 56.0	8 54.0	20	19	59.6	8 53.8	8 51.1	21	12	00.5	8 56.4	8 54.0
20	15	58.3	8 54.4	8 52.3	20	20	02.0	8 53.8	8 51.2	21	12	36.3	8 56.4	8 54.3
20	16	02.6	8 53.6	8 51.4	20	21	09.8	8 53.3	8 50.8	21	12	57.9	8 56.3	8 54.0
20	16	05.4	8 53.0	8 50.7	20	21	12.6	8 53.3	8 50.8	21	13	00.0	8 56.2	8 53.9
20	16	10.3	8 52.3	8 50.1	20	21	57.3	8 53.1	8 50.7	21	13	30.3	8 55.9	8 53.3
20	16	20.3	8 51.2	8 48.7	20	22	00.3	8 53.1	8 50.6	21	13	57.8	8 54.9	8 52.6
20	16	25.3	8 51.4	8 48.9	20	23	56.7	8 51.2	8 48.7	21	14	00.4	8 54.9	8 52.5
20	16	27.8	8 51.7	8 49.3	21st	0	00.4	8 51.2	8 48.7	21	14	30.7	8 54.6	8 52.2
20	16	30.3	8 52.2	8 49.6	21	2	01.1	8 51.6	8 48.8	21	15	00.5	8 55.2	8 52.7
20	16	33.0	8 52.5	8 50.4	21	2	04.3	8 51.6	8 48.9	21	15	03.0	8 55.2	8 52.8
20	16	35.3	8 53.0	8 50.5	21	3	56.5	8 51.2	8 48.8	21	15	10.2	8 55.2	8 52.8
20	16	40.3	8 53.2	8 50.9	21	4	00.0	8 51.4	8 48.8	21	15	21.8	8 55.3	8 52.8
20	16	50.3	8 53.1	8 50.7	21	4	58.5	8 51.7	8 48.9	21	15	30.2	8 55.0	8 52.7
20	16	56.8	8 52.9	8 50.6	21	5	01.5	8 51.7	8 49.0	21	15	40.7	8 54.7	8 52.2
20	17	00.0	8 53.0	8 50.6	21	5	10.3	8 51.7	8 49.0	21	15	50.0	8 54.7	8 52.2
20	17	10.2	8 52.4	8 50.2	21	5	57.1	8 51.8	8 49.0	21	15	58.1	8 54.5	8 52.0
20	17	20.3	8 52.6	8 50.3	21	5	59.8	8 51.7	8 49.0	21	16	00.2	8 54.4	8 51.7
20	17	30.3	8 52.0	8 50.2	21	6	58.1	8 51.4	8 48.6	21	16	10.5	8 53.8	8 51.2
20	17	35.3	8 51.6	8 50.2	21	7	00.4	8 51.5	8 48.6	21	16	20.4	8 53.2	8 50.6
20	17	38.0	8 51.3	8 48.8	21	7	57.9	8 51.3	8 48.6	21	16	27.2	8 52.9	8 50.4
20	17	40.4	8 51.2	8 48.6	21	8	00.4	8 51.3	8 48.7	21	16	29.9	8 52.6	8 50.0
20	17	50.8	8 51.3	8 48.7	21	8	56.9	8 52.6	8 50.4	21	16	40.3	8 51.4	8 49.0
20	17	58.3	8 52.0	8 49.2	21	9	00.0	8 52.7	8 50.5	21	16	50.0	8 52.0	8 49.2
20	18	01.9	8 52.8	8 50.0	21	9	30.5	8 54.0	8 51.8	21	16	57.4	8 52.5	8 49.7
20	18	06.0	8 53.2	8 50.7	21	9	58.7	8 54.5	8 52.2	21	16	59.6	8 52.5	8 49.7
20	18	10.3	8 53.5	8 50.8	21	10	00.5	8 54.5	8 52.2					

Dip

Date and Time			Variometer	Magnetometer No. 5
th	h	m	° ′	° ′
20	13	28.2	60 40.9	60 40.8
20	13	34.9	60 40.9	60 40.8
20	19	32.9	60 41.6	60 41.0
20	19	38.4	60 41.6	60 41.4
21st	5	25.7	60 41.0	60 40.2
21	5	32.3	60 41.0	60 40.3

Horizontal Intensity

Date and Time			Variometer	Magnetometer No. 5				
				Coil	Mag.	Cell	Resist.	Hor.
th	h	m	γ					γ
20	18	38.5	25017	A	C	2	2	25050
20	18	43.1	25019	A	C	2	2	25053
21st	6	25.1	25029	A	C	2	2	25054
21	6	30.1	25029	A	C	2	2	25054
21	11	27.8	25019	A	C	2	2	25054
21	11	32.6	25020	A	C	2	2	25056

DETERMINATION OF THE INSTRUMENTAL CORRECTIONS.

In the present case, first the differences of each magnetic element between the stations and then the instrumental corrections were deduced. According to the foregoing results of observations, the magnetic localities of the stations with respect to the station A are led to the values shown in Table 21. In the table, LA, LB, LC, LD and LE represent the localities of the station A, B, C, D and E correspondingly with respect to the absolute house, for each magnetic element.

Table 21.—Localities of the stations with respect to the station A.

Element	Date	LA—LB	LA—LC	LA—LD	LA—LE
		′	′	′	′
Declination	Feb. 1932	0.3	— 0.2	1.6	.....
	Nov. 1932	0.7	0.6	.....	1.6
	Nov. 1933	— 0.2	— 0.5	.....	.....
	Mean	0.3	0.0	1.6	1.6
		′	′	′	′
Dip	Feb. 1932	— 0.1	0.4	— 0.2	.....
	Nov. 1932	— 0.6	— 1.1	.....	— 1.1
	Nov. 1933	— 0.5	— 0.7	.....	.....
	Mean	— 0.4	— 0.5	— 0.2	— 1.1
		γ	γ	γ	γ
Horizontal Intensity	Feb. 1932	6	6	— 8	.....
	Nov. 1932	2	6	.....	— 1
	Nov. 1933	2	5	.....	.....
	Mean	3	6	— 8	— 1

These values are computed by the same method as adopted for precedent magnetic survey, 1922—23 expect the values of LA—LD which are deduced separately from the results obtained by the magnetometer No. 4 (Nippon Suirobu type) at the stations A and D. The results obtained with the magnetometer No. 11 (Kew pattern) are not employed in the computation of the locality, for they are regarded as less accurate than those obtained by magnetometer No. 4.

The difference of each element between the absolute house and the station B, LB is determined by the results in Tables 16 and 17 as follows : —

Element / Locality	Declination	Dip	Horizontal Intensity
	′	′	γ
LB	— 0.9	— 0.7	9

Then the values of LA, LC, LD and LE are as shown in Table 22, as computed by the value of LB and the mean value each of LA—LB, LA—LC, LA—LD and LA—LE determined at each time.

Table 22.—Localities of the stations with respect to the absolute house.

Element / Locality	LA	LB	LC	LD	LE
	′	′	′	′	′
Declination	— 0.6	— 0.9	— 0.6	— 2.2	— 2.2
Dip (Inclination)	— 1.1	— 0.7	— 0.6	— 0.9	0.0
Horizontal Intensity	13γ	9γ	7γ	21γ	13γ

Using these results, the corrections of the magnetometers on K. M. S. were computed (see Tables 23—25).

Next, in July 1929, T. P. Ault, Captain of the Carnegie IV, and W. C. Perkinson have compared the magnetometer of the Carnegie IV with the Wild-Edelmann's Magnetic Theodolite and the Earth-Inductor No. 70661 of the Kakioka Observatory and have given the following relations :

Declination.....I. M. S. — W. E. M. T. = — 2′.6
Horizontal Intensity .....I. M. S. — W. E. M. T. = + 17γ
Dip (Inclination).....I. M. S. — E. I. No. 70661 = + 1′.9

Here, the corrections of the magnetometers on I. M. S. are deduced by applying the above values to their corrections on K. M. S. and are shown in Tables 23, 24 (opposite the corrections on K. M. S.) and Table 26. The tabulated corrections are to be applied algebraically, west declination being reckoned as positive; north dip as positive; horizontal intensity is always taken as positive.

Table 23.

Declination Corrections Determined.

Magnet-ometer No.	Coil	Mag.	Instrumental Correction on K. M. S.			Instrumental Correction on I. M. S.		
			Feb. 1932	Nov. 1932	Nov. 1933	Feb. 1932	Nov. 1932	Nov. 1933
			′	′	′	′	′	′
3	A	A	1.5	1.6	0.4	−1.1	−1.0	−2.2
		B	.....	0.9	0.9	.....	−1.7	−1.7
		C	.....	0.7	−0.1	.....	−1.9	−2.7
	B	A	1.3	1.5	0.7	−1.3	−1.1	−1.9
		B	1.1	0.9	0.7	−1.5	−1.7	−1.9
		C	1.4	0.8	0.9	−1.2	−1.8	−1.7
4	A	A	1.4	1.2	0.0	−1.2	−1.4	−2.6
		B	0.9	1.0	1.3	−1.7	−1.6	−1.3
		C	1.0	1.9	1.0	−1.6	−0.7	−1.6
	B	A	0.8	1.1	−0.1	−1.8	−1.5	−2.7
		B	.....	1.0	1.3	.....	−1.6	−1.3
		C	.....	2.0	0.5	.....	−0.6	−2.1
5	A	A	2.2	3.3	2.0	−0.4	0.7	−0.6
		B	1.4	2.0	2.5	−1.2	−0.6	−0.1
		C	1.7	2.6	2.0	−0.9	0.0	−0.6
	B	A	1.8	3.2	1.7	−0.8	0.6	−0.9
		B	.....	1.9	2.5	.....	−0.7	−0.1
		C	.....	2.8	1.8	.....	0.2	−0.8

Declination Corrections for Magnetometer No. 11, Kew Pattern.

K. M. S. − K. M. No. 11 = + 0′.9, I. M. S. − K. M. No. 11 = − 1′.7

Table 24.

Inclination Corrections Determined.

Mognet-ometer No.	Correction on K. M. S.			Correction on I. M. S.		
	Feb. 1932	Nov. 1932	Nov. 1933	Feb. 1932	Nov. 1932	Nov. 1933
	′	′	′	′	′	′
3	0.4	0.1	−0.2	2.3	2.0	1.7
4	0.9	0.3	−0.4	2.8	2.2	1.5
5	1.6	0.5	−0.1	3.5	2.4	1.8

Inclination Corrections for Dip-Circle No. 3, Barrow's Type.

K. M. S. − D. C. No. 3 = + 0′.3, I. M. S. − D. C. No. 3 = + 2′.2

Table 25.

Horizontal Intensity Corrections on K. M. S. Determined.

Arrangement / Magnetometer				No. 3			No. 4			No. 5		
Coil	Mag.	Resist.	Cell	Feb. 1932	Nov. 1932	Nov. 1933	Feb. 1932	Nov. 1932	Nov. 1933	Feb. 1932	Nov. 1932	Nov. 1933
				γ	γ	γ	γ	γ	γ	γ	γ	γ
A	A	R_1	C_2	.....	.....	−12	.....	.....	−14	.....	.....	− 6
		R_1	C_3	.....	.....	−11	.....	.....	−12	.....	.....	− 6
		R_2	C_2	− 3	.....	− 8	− 8	.....	−13	+ 3	.....	− 4
		R_2	C_3	.....	.....	−10	.....	.....	−11	.....	.....	− 3
		R_3	C_2	.....	.....	.....	−10	.....	.....	+ 7	.....	.....
	B	R_1	C_2	.....	− 5	−11	.....	.....	−14	.....	.....	− 7
		R_1	C_3	.....	.....	−12	.....	.....	−12	.....	.....	− 6
		R_2	C_2	.....	.....	−10	.....	.....	−13	.....	.....	− 8
		R_2	C_3	.....	.....	−10	.....	.....	−12	.....	.....	− 4
		R_3	C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....
	C	R_1	C_2	.....	.....	− 9	.....	− 3	−14	.....	+ 5	− 8
		R_1	C_3	.....	.....	− 9	.....	.....	−12	.....	.....	− 8
		R_2	C_2	.....	.....	− 7	.....	− 2	−13	.....	+11	− 9
		R_2	C_3	.....	.....	− 7	.....	.....	−10	.....	.....	− 7
		R_3	C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....
B	A	R_1	C_2	.....	.....	−14	.....	.....	− 9	.....	.....	− 8
		R_1	C_3	.....	.....	−14	.....	.....	− 8	.....	.....	− 7
		R_2	C_2	− 9	.....	−15	+ 1	.....	− 9	+22	.....	− 7
		R_2	C_3	.....	.....	−13	.....	.....	− 8	.....	.....	− 6
		R_3	C_2	− 9	.....	.....	.....	.....	.....	.....	.....	.....
	B	R_1	C_2	.....	+ 2	−17	.....	.....	−11	.....	.....	− 7
		R_1	C_3	.....	.....	−17	.....	.....	− 9	.....	.....	− 7
		R_2	C_2	.....	.....	−15	.....	.....	−13	.....	.....	− 4
		R_2	C_3	.....	.....	−15	.....	.....	−11	.....	.....	− 2
		R_3	C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....
	C	R_1	C_2	.....	.....	−17	.....	− 3	−12	.....	+12	− 8
		R_1	C_3	.....	.....	−17	.....	.....	− 9	.....	.....	− 7
		R_2	C_2	.....	.....	−15	.....	.....	−11	.....	.....	− 9
		R_2	C_3	.....	.....	−16	.....	.....	− 9	.....	.....	− 7
		R_3	C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....

Horizontal Intensity Correction on K. M. S. for Magnetometer No. 11.

K. M. S. − M. No. 11 = + 69γ

Table 26.

Horizontal Intensity Corrections on I. M. S. Determined.

Arrangement \ Magnetometer				No. 3			No. 4			No. 5		
Coil	Mag.	Resist.	Cell	Feb. 1932	Nov. 1932	Nov. 1933	Feb. 1932	Nov. 1932	Nov. 1933	Feb. 1932	Nov. 1932	Nov. 1933
				γ	γ	γ	γ	γ	γ	γ	γ	γ
A	A	R_1	C_2	.....	.....	+ 5	.....	.....	+ 3	.....	.....	+11
		R_1	C_3	.....	.....	+ 6	.....	.....	+ 5	.....	.....	+11
		R_2	C_2	+14	.....	+ 9	+ 9	.....	+ 4	+20	.....	+13
		R_2	C_3	.....	.....	+ 7	.....	.....	+ 6	.....	.....	+14
		R_3	C_2	.....	.....	.....	+ 7	.....	.....	+24	.....	.....
	B	R_1	C_2	.....	+12	+ 6	.....	.....	+ 3	.....	.....	+10
		R_1	C_3	.....	.....	+ 5	.....	.....	+ 5	.....	.....	+11
		R_2	C_2	.....	.....	+ 7	.....	.....	+ 4	.....	.....	+ 9
		R_2	C_3	.....	.....	+ 7	.....	.....	+ 5	.....	.....	+13
		R_3	C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....
	C	R_1	C_2	.....	.....	+ 8	.....	+14	+ 3	.....	+22	+ 9
		R_1	C_3	.....	.....	+ 8	.....	.....	+ 5	.....	.....	+ 9
		R_2	C_2	.....	.....	+10	.....	+15	+ 4	.....	+28	+ 8
		R_2	C_3	.....	.....	+10	.....	.....	+ 7	.....	.....	+10
		R_3	C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....
B	A	R_1	C_2	.....	.....	+ 3	.....	.....	+ 8	.....	.....	+ 9
		R_1	C_3	.....	.....	+ 3	.....	.....	+ 9	.....	.....	+10
		R_2	C_2	+ 8	.....	+ 2	+18	.....	+ 8	+39	.....	+10
		R_2	C_3	.....	.....	+ 4	.....	.....	+ 9	.....	.....	+11
		R_3	C_2	+ 8	.....	.....	.....	.....	.....	.....	.....	.....
	B	R_1	C_2	.....	+19	0	.....	.....	+ 6	.....	.....	+10
		R_1	C_3	.....	.....	0	.....	.....	+ 8	.....	.....	+10
		R_2	C_2	.....	.....	+ 2	.....	.....	+ 4	.....	.....	+13
		R_2	C_3	.....	.....	+ 2	.....	.....	+ 6	.....	.....	+15
		R_3	C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....
	C	R_1	C_2	.....	.....	0	.....	+14	+ 5	.....	+29	+ 9
		R_1	C_3	.....	.....	0	.....	.....	+ 8	.....	.....	+10
		R_2	C_2	.....	.....	+ 2	.....	.....	+ 6	.....	.....	+ 8
		R_2	C_3	.....	.....	+ 1	.....	.....	+ 8	.....	.....	+10
		R_3	C_2	.....	.....	.....	.....	.....	.....	.....	.....	.....

Horizontal Intensity Correction on I. M. S. for Magnetometer No. 11.

I. M. S. − M. No. 11 = + 86γ

MAGNETIC STANDARDS ADOPTED.

As the corrections of the magnetometers referred to the two magnetic standards (K. M. S. and I. M. S.) are determined as described before, the observed values may be reduced to either of the standards. The final results of magnetic observations in Table 28, however, are reduced to the International Magnetic Standards.

The reduction of observed values to the adopted standards is executed by applying the mean value of the two corrections, determined by the comparisons made before and after the field observations. However, for the results obtained with the instrument for which the instrumental correction is determined only once or twice, the reduction is executed suitably according to the circumstances, referring to Tables 23, 24 and 26.

ACCURACY OF MAGNETIC RESULTS.

The accuracy of observations in the survey is the same as that in the comparisons. To examine the accuracy of the magnetic results in this volume, the results of comparison observations are compared with each other after correcting them for the localities of the stations and for the instrumental errors of the used magnetometers. In the following table, a part of the results of observations in each comparison, reduced to K. M. S. is shown, as an example, with the variometer values of the observatory.

Table 27.

Results of the Comparison Observations Reduced to the Variometer Values of the Kakioka Observatory.

Declination

Date	Time	Variometer (Variation House) Dec.	Magnetometer No. 3					Magnetometer No. 4					Magnetometer No. 5				
			Station	Coil	Mag.	Corr.	Values	Station	Coil	Mag.	Corr.	Values	Station	Coil	Mag.	Corr.	Values
	h m	° ′				° ′					° ′					° ′	
Feb. 17, 1932	10 51.9	5 41.5	C	B	A	5	41.2	B	A	A	5	41.8	A	A	A	5	41.4
17,	17 31.4	5 44.1	C	A	A	5	44.2	B	B	A	5	44.1	A	B	A	5	44.1
18,	11 00.1	5 42.0	B	B	A	5	41.9	A	A	A	5	41.8	C	A	A	5	42.1
Nov. 26, 1932	11 44.5	5 44.7	A	A	C	5	44.3	E	A	C	5	44.4	C	A	C	5	45.4
26,	12 10.5	5 44.9	A	B	C	5	44.5	E	B	C	5	44.4	C	B	C	5	45.6
26,	14 08.9	5 44.8	A	B	B	5	44.5	E	B	B	5	44.6	C	B	B	5	44.7
Nov. 29, 1933	8 00.3	5 45.4	A	A	A	5	45.7	B	A	C	5	46.0	C	A	C	5	45.1
29,	9 13.7	5 45.7	A	A	A	5	45.7	B	A	A	5	45.9	C	A	A	5	45.8
29,	10 28.8	5 46.8	A	A	A	5	46.7	B	A	B	5	46.6	C	A	B	5	46.7

Dip

Date	Time	Variometer (Variation House) Dec.	Magnetometer No. 3			Magnetometer No. 4			Magnetometer No. 5		
			Station	Corr.	Values	Station	Corr.	Values	Station	Corr.	Values
	h m	° ′		° ′			° ′			° ′	
Feb. 18, 1932	9 19.3	49 27.6	C	49	27.5	B	49	26.8	A	49	26.0
18,	15 55.7	49 27.9	B	49	27.9	A	49	28.4	C	49	29.1
18,	17 14.4	49 28.0	A	49	27.9	C	49	28.3	B	49	28.5
Nov. 26, 1932	15 38.4	49 29.0	A	49	28.8	E	49	28.6	C	49	28.5
27,	18 02.5	49 28.7	E	49	29.1	B	49	29.0	A	49	29.1
28,	13 47.9	49 27.9	B	49	28.0	C	49	27.1	E	49	28.2
Nov. 25, 1933	11 45.7	49 29.5	A	49	30.6	B	49	30.3	C	49	29.9
25,	16 33.9	49 28.8	B	49	29.1	C	49	28.9	A	49	28.8
26,	12 22.9	49 28.9	C	49	29.5	A	49	29.9	B	49	29.5

Horizontal Intensity

Date	Time	Variometer (Variation House) Hor.	Magnetometer No. 3						Magnetometer No. 4						Magnetometer No. 5					
			Station	Coil	Mag.	C	R	Corr. Values	Station	Coil	Mag.	C	R	Corr. Values	Station	Coil	Mag.	C	R	Corr. Values
	h m	γ						γ						γ						γ
Feb. 17, 1932	13 35.7	29710	C	B	A	2	2	29707	B	A	A	2	2	29705	A	A	A	2	2	29707
17,	16 38.4	29724	C	A	A	2	2	29722	B	B	A	2	2	29719	A	B	A	2	2	29721
18,	12 30.2	29729	B	B	A	2	2	29728	A	A	A	2	2	29726	C	A	A	2	2	29728
Nov. 26, 1932	17 02.0	29717	A	A	B	2	1	29723	E	A	C	2	1	29722	C	A	C	2	1	29719
27,	9 58.2	29736	A	B	B	2	1	29738	E	B	C	2	1	29737	C	B	C	2	1	29735
28,	14 52.1	29739	B	A	B	2	1	29737	C	A	C	2	1	29739	E	A	C	2	1	26737
Nov. 29, 1933	8 23.1	29718	A	A	A	2	2	29717	B	A	C	2	2	29716	C	A	C	2	2	29713
29,	8 24.8	29718	A	A	A	2	2	29718	B	A	C	3	2	29715	C	A	C	3	2	29716
29,	8 43.6	29718	A	A	A	2	2	29716	B	A	C	2	1	29715	C	A	C	2	1	29716

OBSERVATIONS IN THE FIELD.

Instrumental Outfit.

Each observation party is equipped with a set of magnetometer-theodolite, a sidereal and a mean time deck-watches. The magnetometer belonging to each party is as shown in Table 1.

Miscellaneous Equipment.

Besides the instrumental outfit described above, each party is supplied with the following : two non-magnetic tents, one of which is an observation tent and the other is a recreation tent and both of them are the same type as that described in the "Bulletin of the Hydrographic Department, Vol. II. 1918"; two folding sofas and three folding chairs; dry cells; small electric lamps; insulated wire and insulator; film or plate camera; drowing tools; repairing tools and materials; a Nautical Almanac; a table of logarithms; recording note-books and reporting papers; the marine and star chart of the Hydrographic Department and the land maps of the Surveying Division of the Army.

Methods of Works in the Field.

Each field party consists of a observer, an assistant and two coolies, and carries the things described above. Arriving in a locality in which the observations are to be made, the party selects a station, where the magnetic disturbance is likely to be least and the conditions of the surroundings are suitable for the astronomical observations and moreover facilities for communication are avilable, and sets up the observation tent. It is not the case, however, when the old station exists. Then the observer and his assistant set up the magnetometer-theodolite immediately and one of them observes two or more terrestrial marks, when possible four marks, in order to test the rotation of the magnetometer-

theodolite. The observations of the terrestrial marks are made as many times as possible, taking the opportunities. During the magnetic observation at the station, the terrestrial marks are observed before or after each dip observation as a rule.

For the second observation, the declination observation is made, while the coolies equip for camping. The declination observation is made many times as sufficient as to trace the curve of its diurnal variation; thus spacing one hour in the daylight and two hours in the night usually. The dip is observed usually at about $4^h.5$, $13^h.5$ and $18^h.5$, and the horizontal intensity at about $5^h.5$, $11^h.5$ and $19^h.5$, each in Japanese Central Standard Time, 9 hours fast of Greenwich. To find the accidental error caused by transportation of the instrument, observations are made with the spare parts of the instrument, e. g., the mirror magnetometer or standard cell or standard resistance.

The true azimuth of a reference line at the station is determined by observation of the stars, not by the sun, unless prevented by lack of time or by cloudy weather in the night. The geographical position of the station is derived from reliable large-scale maps.

The time of magnetic observations is referred to Japanese Central Standard Time, 9 hours fast of Greenwich and that of astronomical observations to Greenwich Sidereal Time. The corrections of the watches are determined at least once a day by means of the time signals by wireless at $11^h\ 00^m$, $12^h\ 00^m$, $21^h\ 00^m$ and $21^h\ 30^m$ by C. S. T.

In the intervals of observations, the observer and his asistant compute the value of each magnetic element from its observations and draw the topography of the station.

In this manner the magnetic observations are usually continued 26—27 hours and after finishing the whole work, members of the party make a copy of the observed results necessary for recomputation in the office. This copy is sent to the office before they leave the station.

Specimens of Observations and Computations.

The schemes of recording observations remain much the same as those of previous survey, except for those of the dip observation. All the recording forms are briefly illustrated, as on the following pages. Besides those specimens, the astronomical observations for determining the true meridian are made more times at a station if possible. Thus, for example at Urusi Tô (Latitude 10° 02′ 15″ N., Longitude 139° 46′ 13″ E.), the observations were made on Polaris (three times), ζ and α Aquilae on the west side of the meridian and on β and α Leonis on the east side of the meridian. The results obtained are as follows:—

The azimuth of the zero line of the horizontal circle at Urusi Tô determined by each star.

Observed Star		Azimuth of the Reference Line					
		Observed Value			Corresponding Mean		
		°	′	″	°	′	″
Polaris	(N)	144	22	42	144	22	36
〃	〃		22	27			
〃	〃		22	38			
ξ Aquilae	(W)	144	22	32	144	22	39
α 〃	〃		22	35			
δ Leonis	(E)		22	40			
β 〃	〃		22	48			
β Cruis	(S)	144	22	36	144	22	36
Final Mean = 144° 22′ 37″							

Thus, the above final mean gives the azimuth of the reference line, almost free from the error arising from the errors of latitude and longitude used in the computations.

Azimuth by a Circumpolar Star at any Time.

Place **Urusi Tô (ウルシ島)** Observer **S. Kuwahara**

Date **June 26, 1933** Recorder **S. Urai**

Instrument No. **3** Name of Star **Polaris**

	Time	Hor.	Ver. (h)	e	w
E	h m s	° ′	° ′		
		A 144 25.0	I 9 5.2	5.3	5.3
	5 57 48.0	B 324 25.1	II 9 5.2	5.2	5.7
		144° 50′ 06″	9° 10′ 24″	5.25	5.50
				0.25	
W		A 324 25.1	I 9 5.4	5.0	6.0
	5 59 52.1	B 144 25.1	II 9 5.4	5.0	6.0
		144° 50′ 12″	9° 10′ 48″	5.00	6.00
				1.00	
	5 58 50.1	144 50 09	9 10 36	0.31	
ΔT	+ 1 31.7				
G.S.T.	6 00 21.8				

$$\tan a_P = -\frac{\cot\delta \sec\varphi \sin t}{1-\cot\delta \tan\varphi \cos t},\quad t = T + \Delta T - \alpha,\quad A_0 = A - a'_P$$

$\alpha =$ 1h 38m 03.7s $\quad \delta =$ 88° 56′ 33″

$\lambda =$ 139° 46′ 13″ = 9h 19m 04.9s $\quad \varphi =$ 10° 02′ 15″

$T =$ 6h 00m 21.8s	$\log\cot\delta =$ 8.266207
$\lambda =$ 9 19 04.9	$\log\sec\varphi =$ 0.006699
$T+\lambda =$ 15 19 26.7	$\log(\cot\delta\sec\varphi) =$ 8.272906
$\alpha =$ 1 38 03.7	$\log\sin t =$ 9.631526
$t =$ 13 41 23.0	sum = 7.904432
$\log\cot\delta =$ 8.266207	$\log\frac{1}{1-a} =$ −0.001281
$\log\tan\varphi =$ 9.247978	$\log\tan a_P =$ 7.903151
$\log(\cot\delta\tan\varphi) =$ 7.514185	$a_P =$ −0° 27′ 30″
$\log\cos t =$ 9.956044	b tan h = 01
$\log a =$ 7.470229	$a'_P =$ −0 27 29
b = 4″.7 tan h = 0.161	A = 144 50 09
b tan h = 0″.75	$A_0 =$ 144 22 38

Azimuths by Time.

Date **June 26, 1933** Name of star **δ Leo**

Observer **S. Kuwahara** Place **Urusi Tô (ウルシ島)**

Recorder **S. Urai** Station $\varphi = 10° 02′ 15″$, $\lambda = 139° 46′ 13″ = 9^h 19^m 04^s.9$

I. Observation

Circle	Time	Horizontal Circle	Mean	Vertical Circle	Mean
	h m s	° ′	° ′	° ′	° ′
Right	6 06 27.8	A 72 24.2	72 48.5	27 19.8	27 39.5
		B 252 24.3		27 19.7	
	07 31.3	A 72 24.2	72 48.6	27 12.1	27 24.2
		B 252 24.4		27 12.1	
Mean	6 06 59.6		72° 48′ 33″		27° 31′ 51″
Left	6 09 45.0	A 252 24.1	72 48.3	26 26.9	26 53.8
		B 72 24.2		26 26.9	
	11 39.8	A 252 24.4	72 49.0	26 13.2	26 26.3
		B 72 24.6		26 13.1	
Mean	6 10 42.4		72° 48′ 39″		26° 40′ 03″
Mean of Means	6 08 51.0	Hor. Circle = 72° 48′ 36″		h = 27° 05′ 57″	

Level				
Circle	Right		Left	
	L	R	L	R
	6.2	4.6	6.4	4.4
	6.0	4.9	6.5	4.3
Sum	12.2	9.5	12.9	8.7
Diff	2.7		4.2	
Diff/4	0.68		1.05	
Mean	0.86			
b	″ 12.9			
tan h	0.512			
b. tan h	″ 6.6			

II. Hour Angle

I mean	Obs. Time	I	h m s
			6 08 51.0
	Δ T	2	+01 31.7
(1)+(2)	Corr. Obs. T.	3	6 10 22.7
	Long. in. T.	4	9 19 04.9
(3)+(4)	P. S. T.	5	15 29 27.6
almanac	R. A. of *	6	11 10 34.7
(5)−(6)	*'s H. A. (c)	7	4 18 52.9
(7)/2	*'s $\frac{C}{2}$	8	2 09 26.45

III. Polar Distance

	δ	I	° ′ ″
			20 53 24
90° ± (1)	P	2	69 06 36
90° − φ	φ′	3	79 57 45
(2)+(3)	P + φ′	4	149 04 21
(2)−(3)	P − φ′	5	−10 51 09
(4)/2	½ (P + φ′)	6	74 32 10
(5)/2	½ (P − φ′)	7	−5 25 35

IV. Azimuth

							° ′ ″
III. (7)	log cos ½(P−φ′)	1	9.998049		½ (A−B)	5′	−8 48 08
III. (6)	″ sec ½(P+φ′)	2	0.574089		½ (A+B)	5	80 22 05
II. (8)	″ cot ½C	3	0.198152		½ (A−B)	5′	−8 48 08
(1)+(2)+(3)	″ tan ½(A+B)	4	0.770290	(5)+(5′)	A	6	71 33 57
III. (7)	″ sin ½(P−φ′)	1′	8.975739n	I	b. tan h	7	07
III.	″ cosec ½(P+φ′)	2′	0.016014	(6)+(7)	Azi. from N.	8	71 34 04
II. (8)	″ cot ½C	3′	0.198152	I	Hor. Circle	9	72 48 36
(1′)+(2′)+(3′)	″ tan ½(A−B)	4′	9.189905n	(9)−(8)	Due N.	10	144 22 40

DECLINATION

Place **Urusi Tô (ウルシ島)** Observer **S. Kuwahara**
Date **June 27, 1933** Recorder **S. Urai**
Instrument No. **3** Coil **A** Magnet **C**

Time		Mark / Micro.	N, Curr +		S, Curr −		Mean	
	h m		°	′	°	′	°	′
Initial	3 01.2	A	56	08.7	56	08.1	236	16.8
Final	3 03.4	B	236	08.7	236	08.2	236	16.9
Mean	3 02.3	Mean	236	17.4	236	16.3	236	16.9
Δ T	− 02.5	Reading of due North + 90° =					234	22.7
T	2 59.8	Corr. for rotation of Horizontal Circle =					−	00.3
						δ =	−1	53.9
Initial	4 01.4	A	56	08.6	56	08.1	236	16.7
Final	4 04.1	B	236	08.7	236	08.2	236	16.9
Mean	4 02.8	Mean	236	17.3	236	16.3	236	16.8
Δ T	− 02.5	Reading of due North + 90° =					234	22.7
T	4 00.3	Corr. for rotation of Horizontal Circle =					−	00.3
						δ =	−1	53.8

DIP

Place **Urusi Tô (ウルシ島)** Observer **S. Kuwahara**
Date **June 27, 1933** Recorder **S. Urai**
Instrument No. **3** Mag. Meridian **146° 8′.9 × 2**

Time		V. Circle / Micro.	E		W		O	
	h m		°	′	°	′	°	′
Initial	6 23.0	I	6	18.0	6	27.9	6	45.9
Final	6 28.3	II	6	18.1	6	27.8	6	45.9
Mean	6 25.7	Mean	6	36.1	6	55.7	6	45.9
Δ T	− 02.5							
T	6 23.2							
Initial	6 31.2	I	6	17.9	6	28.1	6	46.0
Final	6 32.7	II	6	18.0	6	28.0	6	46.0
Mean	6 32.0	Mean	6	35.9	6	56.1	6	46.0
Δ T	− 02.5							
T	6 29.5							

HORIZONTAL INTENSITY

Place **Urusi Tô (ウルシ島)** Observer **S. Kuwahara**
Date **June 27, 1933** Recorder **S. Urai**
Instrument No. **3** Coil **A** Cell **2** Resist. **1** Mag. **C**

Mag. Meridian **149° 08′.9 × 2**

Time		Curr. / Micro.	+		−		Difference		Temperature	
	h m		°	′	°	′	°	′	tc	ts
Initial	5 22.8	A	19	04.9	273	13.5	105	21.4		
Final	5 25.5	B	199	05.0	93	13.7	105	21.3	26.0	27.8
Mean	5 24.2	mean	199	09.9	93	27.2	105	42.7		
Δ T	− 02.5									
T	5 21.7						$\varphi = 52$	51.3_5		
Initial	5 30.4	A	19	04.9	273	13.8	105	21.1		
Final	5 33.3	B	199	05.0	93	13.9	105	21.1	26.2	27.8
Mean	5 31.9	Mean	199	09.9	93	27.7	105	42.2		
Δ T	− 02.5									
T	5 29.4						$\varphi = 52$	51.1_0		
Initial	11 15.2	A	19	00.1	273	15.1	105	15.0		
Final	11 18.0	B	199	00.1	93	15.2	105	14.9	36.1	28.8
Mean	11 16.6	Mean	199	00.2	93	30.3	105	29.9		
Δ T	− 02.5									
T	11 14.1						$\varphi = 52$	44.9_5		

$$H = \frac{H_{20}}{\sin \varphi}\{1 + f(\Delta t_c)\}\{1 + g(\Delta t_s)\}$$

Observed Time	h m 5 21.7	h m 5 29.4	h m 11 14.1
log H_{20}	9.462140	9.462140	9.462140
log sin φ	9.901523	9.901499	9.900909
log H_0	9.560617	9.560641	9.561231
log $\{1+f(\Delta t_c)\}$	− 48	− 50	− 130
log $\{1+g(\Delta t_s)\}$	− 200	− 200	− 226
log H	9.560369 +	9.560391 +	9.560875 +
H	0.36339	0.36341	0.36381

TERRESTRIAL MARKS

Terr. Mark \ Time	th h m 26 13 34	th h m 26 17 13	th h m 27 6 44	th h m 27 13 40	th h m 27 17 48
T. M. 1	240° 47′.7	240° 47′.6	240° 47′.8	240° 47′.6	240° 47′.6
T. M. 2	327 38.9	327 38.8	327 38.9	327 38.8	327 38.6
T. M. 3	60 29.0	60 29.0	60 29.2	60 28.9	60 28.9
T. M. 4	149 13.0	149 12.9	149 13.3	149 13.0	149 12.9

REVISIONS OF FIELD COMPUTATIONS.

Though the preliminary computations of the observations during 1932—33 had been all made by the observers themselves in the field, they were recomputed in the office by the same persons with the original field records after this survey. Changes in times of the magnetic observations, and of the astronomical observations necessary for determination of the true azimuth of a reference line at a magnetic station are frequently made in these revisions. Owing to the careful transportation of the deck-watches, there has not been so irregular changes of their rates as the corrections for the watch time is doubtful in accuracy in so far as we are concerned now.

The geographical position of a station derived from the map in the field is not altered except the obvious error in it, for it ought to have been determined, upon inspection of the actual place, in the field most accurately.

In the recomputation of the results of observations of horizontal intensity in 1933, the magnetometer constants used in the field computation were replaced by those in Tables 12—14. This replacement does not affect the value of horizontal intensity more than 10 gammas.

Revising all the results carefully, the diurnal mean (approximate for horizontal intensity and dip) has been taken as the value on the observed day at the station and then the instrumental corrections on I. M. S. are applied to those diurnal means, giving the results in Table 28 (see the Remarks on Table 28).

RESULTS OF MAGNETIC OBSERVATIONS, 1932—33.

Explanatory Remarks for Results of Magnetic Observations, 1932—33.

All results obtained by the decennial magnetic survey during 1932—33 and by auxiliary magnetic observations of the Department during 1927—34 are shown in Table 50 designated as the "Complete List of Magnetic Observations". The condensed results of them are given in Table 28 designated as the "Results of Magnetic Observations", the values being reduced to the International Magnetic Standards. In both tables, the stations are tabulated separately for each of the districts and regions; thus, Tisima Rettô, Karahuto, Hokkaidô, Honsyû, Sikoku, Kyûsyû, Manchoukuo, Tyôsen, Izu Syotô, Ogasawara Guntô, Nansei Syotô, Taiwan, Mariana Syotô, Nisi-Karorin Syotô, Higasi-Karorin Syotô and Mâsyaru Syotô.

The observed magnetic elements are tabulated in the order of Declination, Dip and Horizontal Intensity for each station. The spelling adopted for the place names in Japan is in the official system, viz., "Nippon Rômazi" and for other places that of the sovereign state are followed.

The values of the declination, as also of dip, are given in degrees, minutes and tenths of minutes of arc, west declination and north dip being reckond as positive. The values of the horizontal intensity (horizontal intensity is always taken as positive) are given in the unit of gamma, $\gamma = 10^{-5}$ C. G. S. unit; but for a instrument which is not regarded as capable of yielding great accuracy, only the value to the fourth decimal place of gauss is given, as it would be necessary otherwise to round out the observed values by zero. The north component X, west component Y and downward component Z are calculated from the observed values of the declination, the dip and the horizontal intensity, and these are similarly expressed.

Remarks on the Complete List of Magnetic Observations (Table 50).—All the original results of magnetic observations are completely shown in Table 50, and the diurnal variations of declinations at the stations are known by this.

The instrument used and the month and year of observations are shown on the left top of the declination results.

The tabular values of the magnetic elements are direct observed values not containing corrections on any magnetic standards. As the principal object of this table is to give the diurnal variation, the difference of the absolute value between the stations is not so important. If it is necessary to reduce these observed values to I. M. S. or K. M. S., corrections in Tables 23—26 are to be used.

As the magnetometer is fitted with two Helmholtz-Coils and three mirror magnetometers, the one used for the observation is shown in the columns of "Coil" and "Mag." respectively.

In the table of horizontal intensity results, the combination of the standard cell and the resistance which have been used for the observation will be known from the sixth and seventh columns. The temperatures of the coil and current standard meter are given in the eighth and ninth columns.

Keys to the abbreviations of the observers' names.

Name	Abbr.	Name	Abbr.
Hideo Asahina	H. A.	Syôitirô Hayami	S. H.
Ikuzô Yamakawa	I. Y.	Ryûiti Hirata	R. H.
Yosiki Kurokawa	Y. K.	Kingo Nagoya	K. N.
Kôzi Kobayasi	K. Ko.	Gorô Oka	G. O.
Asaiti Muramoto	A. M.	Sakuzi Tanaka	S. T.
Keisaku Kudô	K. Ku.	Zyôhei Yosida	Z. Y.
Susumu Kuwahara	S. K.	Singo Urai	S. U.
Tosihiko Ogawa	T. O.	Masatosi Mituno	M. M.
Hideo Higasinaka	H. H.	Eizi Hurukawa	E. H.

Remarks on Results of Magnetic Observations (Table 28).—The values of magnetic elements contained in this table are condenced from the results in Table 50 and reduced to the International Magnetic Standards.

As for declination, each of the tabular values is not a simple arithmetical mean of observed values at a station, but it is the mean of hourly values derived from the smoothed diurnal curve of declination which is traced on a section paper according to the all observed values at the station. Hence the value of declination in this table is strictly corrected for diurnal variation. It is somewhat different for dip and horizontal intensity; each of the tabular value is determined by the mean of all or selected observed values at the station.

The first column in the table is headed "Station" and this is divided into two sub-columns, giving the number and the name of place at which the magnetic elements have been observed. In the next column headed "Position" the latitude and longitude of the observing station are given corresponding to each name of place.

The fifth column headed "Relation to former survey" shows the situation of observed point of this magnetic survey with respect to the previous one (the oldest position established by the Department is adopted as the standard). In this column, the letter A indicates that the old station was reoccupied exactly, B that a new station established within 0.5 kilometre of the old one, C that a new station was at a greater distance than in the case of B, and N that a new station was established independently of the old one and situated at a greater distance than all of the others.

The date of the observations will be found on the sixth column as represented to second decimal place of year. For the representation of the year, first two figures, 19, were omitted; 32.86, for example, means 1932.86.

The values of magnetic elements will be found in the next columns. Among these elements, the first three elements (declination, dip and horizontal intensity) are the observed values reduced to the International Magnetic Standards; but the latter three elements, the north component X, west component Y and downward component Z, are calculated from the values of former three elements.

Table 28. — RESULTS OF MAGNETIC OBSERVATIONS.

Tisima Rettô (千島列島)

No.	Station Name	Position Latitude	Position Longitude	Ralation to former survey	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
1	Simusyu Tô (占守島)	50 43.3	156 11.9	C	33.66	4 27.9	63 16.6	22879	22810	1781	45444
2	Paramusiru Tô (幌筵島)1	50 22.2	155 36.3	N	.65	5 50.8	62 26.6	23295	23174	2373	44641
3	〃 (〃)2	50 17.0	155 20.1	N	.65	5 27.1	62 06.6	23454	23348	2228	44316
4	Onekotan Tô (温禰古丹島)	49 27.4	154 42.4	A	.64	3 44.5	61 00.0	23868	23817	1558	43059
5	Syasukotan Tô (捨子古丹島)	48 46.9	154 02.6	A	.66	4 39.0	60 56.5	23844	23766	1933	42913
6	Ketoi Tô (計吐夷島)	47 18.2	152 29.0	A	.70	5 13.9	59 36.5	24571	24469	2240	41894
7	Simusiru Tô (新知島)1	47 04.5	152 11.3	N	.70	5 34.2	59 22.5	24948	24830	2421	42143
8	〃 (〃)2	46 51.5	151 51.8	C	.71	5 24.9	58 46.0	25232	25119	2381	41608
9	Uruppu Tô (得撫島)	46 12.9	150 19.9	N	.69	6 45.5	59 04.4	25068	24894	2959	41841
10	Etorohu Sima (擇捉島)1	45 13.5	147 52.6	B	32.81	6 02.1	57 47.4	25887	25744	2722	41092
11	〃 (〃)2	45 13.3	147 53.8	N	.83	5 25.0	58 03.1	25743	25628	2430	41280
12	〃 (〃)3	45 13.2	147 52.6	N	.82	7 11.1	57 26.0	26202	25996	3277	41023
13	Kunasiri Sima (國後島)	44 01.4	145 51.7	C	33.72	6 12.4	56 39.2	26796	26639	2897	40721
14	Sikotan Sima (色丹島)	43 51.8	146 49.8	B	32.77	6 14.4	57 45.0	26102	25947	2837	41369

Karahuto (樺太)

15	Sikuka (敷香)1	49 13.7	143 06.9	N	32.70	9 08.3	62 47.8	23942	23638	3802	46579
16	〃 (〃)2	49 13.5	143 06.9	B	.71	9 09.0	62 59.0	23799	23496	3785	46675
17	Usiro (鵜城)	48 50.5	141 57.1	B	.69	9 22.0	62 41.8	24047	23726	3914	46584
18	Kaihyô Tô (海豹島)	48 30.1	144 37.6	A	.72	8 32.1	61 56.7	24453	24182	3629	45883
19	Maoka (眞岡)1	47 02.6	142 03.2	B	.67	9 07.0	60 54.5	25065	24748	3972	45048
20	〃 (〃)2	47 02.5	142 02.8	N	.67	9 12.4	60 52.5	25087	24764	4014	45026
21	Toyohara (豊原)	46 57.4	142 45.2	C	.72	8 50.2	60 43.7	25077	24779	3852	44739
22	Ôtomari (大泊)	46 38.8	142 46.5	C	.73	8 36.8	60 24.1	25268	24983	3784	44483
23	Kaiba Tô (海馬島)1	46 16.9	141 13.1	B	.63	8 11.1	60 51.4	25354	25096	3610	45471
24	〃 (〃)2	46 15.6	141 15.3	B	.63	6 53.2	62 24.0	24769	24590	2970	47379
25	〃 (〃)3	46 14.3	141 15.2	N	.64	7 41.0	60 43.0	25027	24802	3346	44628
26	〃 (〃)4	46 13.8	141 13.4	N	.64	7 46.3	60 12.7	25360	25127	3429	44302
27	Sôni (宗仁)1	46 03.3	141 56.1	N	.65	8 53.2	60 07.0	25511	25205	3941	44395
28	〃 (〃)2	46 02.1	141 56.2	N	.66	8 51.8	60 04.3	25548	25243	3936	44378
29	〃 (〃)3	46 01.6	141 56.9	N	.66	8 54.4	60 04.4	25524	25216	3952	44340

Hokkaidô (北海道)

30	Wakkanai (稚內)	45 25.3	141 40.5	A	32.74	8 42.3	59 21.7	25932	25633	3925	43782
31	Ositomari (鴛泊)	45 14.4	141 13.7	N	33.74	8 54.8	59 56.2	26078	25763	4041	45053
32	Monbetu (紋別)	44 20.9	143 20.9	B	32.75	7 48.6	58 00.2	26307	26063	3575	42105
33	Rumoi (留萌)	43 56.7	141 38.2	A	33.75	8 19.7	57 36.8	26778	26495	3879	42217
34	Sibetu (標津)	43 39.3	145 08.4	B	32.79	7 09.6	57 20.5	26318	26113	3280	41060
35	Sapporo (札幌)1	43 04.3	141 21.0	B	32.86	7 56.2	56 52.0	26896	26638	3714	41206
36	〃 (〃)2	43 04.0	141 20.6	N	.87	7 35.1	56 57.7	26910	26675	3552	41377
37	Siranuka (白糠)	42 57.1	144 04.8	A	.80	6 47.4	56 40.0	26805	26617	3169	40755
38	Saruhuto (佐沼太)	42 30.8	142 02.4	B	33.61	7 40.2	56 31.3	27063	26821	3612	40921
39	Setana (瀬棚)	42 26.9	139 51.5	A	32.75	7 37.0	56 18.4	27485	27243	3643	41222
30	Biro-o (美尾)	42 17.1	143 19.1	A	.86	6 58.3	55 49.1	27252	27051	3308	40128
31	Mori (森)	42 06.1	140 34.8	B	.74	7 17.4	56 12.9	27324	27103	3469	40839
32	Hukuyama (福山)	41 25.7	140 06.7	B	33.62	7 19.7	54 56.8	28072	27843	3581	40012

Honsyû (本洲)

43	Nohezi (野邊地)	40 52.2	141 06.3	B	32.76	7 29.5	54 48.4	27837	27599	3629	39471
44	Azigasawa (鯵ヶ澤)	40 46.5	140 12.8	A	33.76	7 03.1	54 50.8	27965	27754	3433	39711
45	Kuzi (久慈)	40 11.5	141 47.1	A	32.77	6 30.7	54 02.8	28262	28080	3205	38966
46	Akita (秋田)1	39 43.0	140 06.1	N	.73	6 39.8	53 32.9	28482	28290	3305	38559
47	〃 (〃)2	39 42.5	140 07.6	A	.72	6 49.1	53 30.1	28533	28331	3387	38562
48	Sakata (酒田)	38 54.4	139 50.8	C	33.76	6 38.6	52 42.5	28813	28620	3333	37834
49	Onagawa (女川)	38 26.7	141 26.9	A	32.78	6 06.7	51 54.9	28777	28614	3064	36721
50	Sendai (仙臺)1	38 15.6	140 54.0	B	33.78	6 21.0	51 56.2	28813	28636	3187	36795
51	〃 (〃)2	38 14.5	140 51.6	C	.77	6 48.5	52 02.0	28792	28589	3413	36896
52	Ebisu (夷)	38 05.1	138 25.7	B	.79	6 39.0	51 52.9	29260	29063	3388	37292
53	Aikawa (相川)1	38 02.2	138 14.6	N	.79	6 43.0	52 01 1	29047	28848	3397	37203
54	〃 (〃)2	38 01.1	138 13.6	A	.79	6 33.6	51 47.3	29231	29040	3339	37130
55	Nîgata (新潟)1	37 56.2	139 03.5	A	32.72	6 28.2	51 52.1	29096	28911	3279	37065
56	〃 (〃)2	37 55.1	139 02.3	B	.70	6 35.8	51 53.4	29043	28851	3336	37027
57	Wazima (輪島)1	37 23.6	136 53.9	A	.69	6 29.3	51 21.5	29639	29449	3349	37073
58	〃 (〃)2	37 23.4	136 53.9	N	.69	6 15.7	51 15.2	29674	29497	3237	36977
59	Itoigawa (糸魚川)	37 02.2	137 52.0	B	33.81	6 17.9	50 53.1	29515	29337	3238	36299
60	Ueda (植田)	36 54.9	140 48.3	B	32.78	5 46.2	50 20.5	29428	29279	2959	35499
61	Sioya (塩屋)	36 17.8	136 15.1	B	33.54	6 05.2	50 16.7	29998	29829	3181	36105
62	Saigô (西郷)	36 12.1	133 20.2	B	.52	6 54.5	51 03.5	30689	30466	3691	37977
63	Hisiura (菱浦)1	36 06.1	133 05.1	B	.53	5 48.5	50 19.6	30846	30688	3122	37189
63′	〃 (〃)2	36 05.9	133 05.0	B	.53	6 01.6	51 42.4	29956	29790	3144	37940
64	Tyôsi (銚子)1	35 44.2	140 51.6	N	32.79	5 30.1	48 48.6	29886	29748	2865	34150
65	〃 (〃)2	35 43.8	140 49.7	B	.80	5 04.6	48 22.7	30219	30101	2674	34011
66	Iida (飯田)1	35 31.4	137 49.3	A	33.81	5 40.8	49 00.6	30160	30012	2985	34707
67	〃 (〃)2	35 30.6	137 50.2	N	.82	5 41.7	48 58.9	30153	30004	2992	34665
68	Obama (小濱)	35 30.1	135 44.8	A	32.68	5 58.6	49 12.7	30490	30324	3175	35338
69	Tottori (鳥取)	35 29.9	134 14.4	A	33.54	6 04.7	49 34.7	30562	30390	3236	35883
70	Imaiti (今市)	35 21.7	132 45.2	A	32.67	5 55.8	49 52.9	30494	30331	3150	36189
71	Kamogawa (鴨川)	35 05.8	140 06.3	A	33.83	5 22.5	48 04.3	30094	29962	2819	33507
72	Tomida (富田)	35 00.2	136 39.1	A	.36	5 40.8	48 35.1	30490	30340	3018	34566
73	Kakegawa (掛川)	34 46.4	138 01.0	A	32.60	5 21.6	48 04.3	30495	30362	2849	33953

Table 28. — RESULTS OF MAGNETIC OBSERVATIONS.

Honsyû (本洲)

No.	Station Name	Position Latitude	Position Longitude	Relation to former survey	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
74	Okayama (岡山)1	34 40.3	133 56.2	A	32.34	5 40.6	48 31.6	30912	30761	3058	34972
75	〃 (〃)2	34 39.4	133 56.2	N	.35	5 31.3	48 19.3	31013	30869	2984	34835
76	Miyagawa (宮川)	34 30.1	136 40.5	A	.36	5 27.8	47 55.8	30702	30563	2923	34014
77	Hirosima (廣島)1	34 23.0	132 27.0	A	.36	5 29.6	48 16.3	31242	31099	2991	35030
78	〃 (〃)2	34 22.6	132 27.5	N	.36	5 56.5	48 12.9	31211	31043	3231	34926
79	Sumoto (洲本)1	34 20.3	134 53.5	A	33.37	5 29.4	47 55.1	30964	30822	2962	34290
80	〃 (〃)2	34 20.1	134 54.5	N	.38	5 29.2	47 56.5	30942	30800	2958	34294
81	Yamaguti (山口)	34 10.6	131 28.7	A	.51	5 23.8	48 09.8	31383	31244	2952	35055
82	Minabe (南部)	33 45.8	135 19.4	A	.36	5 17.8	47 08.9	31107	30974	2871	33532
83	Katuura (勝浦)	33 37.8	135 56.7	A	32.37	5 14.5	46 56.8	31059	30929	2838	33245
84	Siono Misaki (潮ノ岬)	33 26.7	135 45.4	N	27.16	5 05.0	46 45.8	31094	30972	2755	33069

Sikoku (四國)

No.	Station Name	Position Latitude	Position Longitude	Relation to former survey	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
85	Tokusima (德島)	34 03.8	134 34.6	B	32.59	5 25.0	47 38.6	31075	30936	2933	34083
86	Imabari (今治)	34 03.7	133 00.9	A	33.39	5 24.3	47 51.0	31218	31079	2941	34489
87	Susaki (須崎)	33 23.1	133 17.2	A	32.38	5 15.9	46 59.1	31408	31275	2882	33663

Kyûsyû (九州)

No.	Station Name	Position Latitude	Position Longitude	Relation to former survey	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
88	Izuhara (嚴原)1	34 12.2	129 17.5	A	33.44	5 30.2	48 35.0	31484	31339	3019	35691
89	〃 (〃)2	34 12.1	129 17.8	N	.44	5 33.2	48 36.1	31437	31290	3042	35660
90	Nakatu (中津)	33 36.2	131 11.3	A	32.58	5 16.8	47 34.5	31590	31456	2907	34565
91	Karatu (唐津)	33 27.1	129 58.2	B	.66	5 10.9	47 30.2	31933	31802	2884	34853
92	Sasebo (佐世保)	33 09.9	129 42.6	N	.65	4 53.4	46 53.2	31972	31856	2725	34150
93	Saeki (佐伯)	32 57.0	131 53.9	B	.39	5 15.0	46 46.1	31672	31539	2898	33690
94	Miyazi (宮地)	32 56.2	131 07.3	B	33.41	4 37.2	46 48.1	31725	31622	2555	33786
95	Aso (阿蘇)	32 53.0	131 00.6	N	.41	4 30.8	47 36.9	31216	31119	2456	34204
96	Takamori (高森)	32 48.5	131 07.9	N	.42	5 36.8	45 35.5	32314	32159	3161	32988
97	Simabara (島原)	32 47.3	130 22.2	A	.43	4 51.2	46 36.5	31849	31735	2695	33572
98	Tomie (富江)1	32 36.9	128 45.9	A	32.62	4 25.7	46 02.3	32007	31911	2471	33189
99	〃 (〃)2	32 36.6	128 45.9	N	.63	4 47.9	46 11.0	32749	32634	2739	34130
100	Miyazaki (宮崎)1	31 55.4	131 25.2	A	.40	4 44.0	45 19.9	32191	32081	2656	32566
101	〃 (〃)2	31 54.9	131 25.4	N	.41	5 01.7	45 33.4	31564	31442	2767	32183
102	Sibusi (志布志)	31 28.3	131 05.7	N	33.42	4 23.3	44 38.1	32391	32296	2479	31981
103	Makurazaki (枕崎)	31 15.9	130 17.5	A	32.42	4 13.2	44 45.0	32339	32251	2380	32058
104	Nisino-omote (西ノ表)	30 44.2	130 59.6	A	32.43	4 17.9	43 37.0	32650	32558	2447	31110
105	Nase (名瀬)1	28 22.6	129 29.9	N	.45	3 24.6	39 57.4	33700	33640	2004	28234
106	〃 (〃)2	28 22.1	129 30.1	B	.44	3 31.0	40 22.4	33628	33565	2063	28593

Manchoukuo (滿洲國)

No.	Station Name	Position Latitude	Position Longitude	Relation to former survey	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
								C. G. S.	C. G. S.	C. G. S.	C. G. S.
107	Fugdin (富錦)	47 15.5	132 00.7	N	33.36	9 28.1	62 59.7	0.2314	0.2282	0.0381	0.4541
108	Chiangchiao (江橋)	46 43.3	123 39.8	N	.63	8 12.1	63 59.7	0.2440	0.2415	0.0348	0.5002
109	Siaokuton (小古洞)	46 14.7	129 22.9	N	.38	9 13.1	62 21.7	0.2393	0.2362	0.0383	0.4570
110	Harbin (哈爾賓)	45 47.6	126 38.3	N	.70	8 23.1	62 40.7	0.2521	0.2494	0.0368	0.4880
111	Sanchan (三站)	45 30.7	125 39.6	N	.59	8 15.1	62 26.7	0.2525	0.2499	0.0362	0.4839
112	Petuna (扶餘)	45 18.5	124 41.8	N	.52	8 12.1	62 27.7	0.2548	0.2522	0.0363	0.4887
								γ	γ	γ	γ
113	Moukden (奉天)1	41 47.3	123 24.0	N	32.54	6 41.2	58 34.7	27742	27553	3230	45410
114	〃 (〃)2	41 47.0	123 23.8	N	.54	6 42.9	58 43.9	27621	27432	3230	45485
115	Hulutao (葫蘆島)1	40 43.3	120 58.9	N	.39	6 11.2	57 44.6	28391	28225	3059	44985
116	〃 (〃)2	40 43.3	121 00.5	N	.40	6 13.5	57 52.8	28195	28029	3057	44912
117	Eikô (營口)	40 40.4	122 16.5	B	.57	5 58.2	57 54.3	28266	28113	2940	45069
118	Changshanssu (長山寺)	40 23.0	120 35.0	N	33.58	5 45.4	57 14.6	28779	28634	2887	44731
119	Chaoshihkow (趙氏溝)	39 53.3	124 12.6	N	34.73	6 16.4	56 35.0	28900	28727	3158	43801
120	Chang i Tau (大王家島)	39 27.1	123 03.5	N	33.42	6 05.4	56 01.4	29148	28984	3092	43252
121	Huranten (普蘭店)	39 23.8	121 57.3	B	32.55	5 29.3	56 23.6	28956	28823	2769	43571
122	Syûsuisi (周水子)	38 57.2	121 33.0	A	.56	5 28.8	55 46.2	29347	29213	2803	43134
123	Ryozyun (旅順)	38 47.7	121 15.9	N	33.62	5 37.6	55 35.9	29575	29432	2900	43190

Tyôsen (朝鮮)

No.	Station Name	Position Latitude	Position Longitude	Relation to former survey	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
124	Yûki (雄基)1	42 20.1	130 25.4	B	32.48	7 41.4	58 03.9	27630	27382	3697	44329
125	〃 (〃)2	42 20.0	130 26.1	N	.48	8 02.3	58 00.2	27609	27338	3861	44189
126	Seisin (清津)1	41 46.5	129 48.1	B	33.50	5 51.6	58 06.2	27632	27487	2821	44399
127	〃 (〃)2	41 45.8	129 46.6	N	.50	6 51.6	57 39.9	27727	27528	3312	43801
128	Zyôsin (城津)1	40 39.9	129 11.8	B	.49	7 04.3	56 31.0	28459	28242	3504	43024
129	〃 (〃)2	40 39.6	129 12.4	N	.48	7 11.9	56 24.9	28501	28276	3571	42922
130	Hokusei (北青)	40 14.0	128 18.4	A	32.46	7 02.2	56 13.3	28683	28467	3514	42881
131	Gisyû (義州)	40 12.6	124 32.3	B	.53	6 27.1	56 50.7	28507	28327	3203	43638
132	Kisen (熙川)	40 09.9	126 16.3	B	.52	6 48.3	56 25.3	28680	28478	3398	43202
133	Genzan (元山)1	39 09.9	127 25.7	B	33.47	6 41.7	55 00.8	29238	29039	3409	41777
134	〃 (〃)2	39 09.6	127 26.7	A	.47	6 41.8	55 01.6	29234	29035	3409	41792
135	〃 (〃)3	39 09.6	127 26.7	A	.48	6 39.9	55 01.8	29232	29034	3393	41794
136	Heizyô (平壤)1	39 01.7	125 45.0	N	32.51	6 25.7	55 09.1	29361	29176	3287	42169
137	〃 (〃)2	39 00.3	125 43.5	B	.50	6 20.2	55 11.2	29334	29155	3238	42185
138	Mukinho (夢金浦)	38 10.9	124 47.0	A	.49	5 56.9	54 14.4	29791	29631	3087	41367
139	Tyûmonsin (注文津)	37 53.4	128 49.8	A	.45	6 24.5	53 13.0	29875	29688	3334	39959
140	Zinsen (仁川)	37 28.5	126 37.6	A	.44	6 03.5	53 12.5	30048	29880	3171	40178
141	Gôsen (鰲川)	36 26.1	126 31.2	A	.43	5 43.6	51 52.6	30603	30450	3054	38997

Table 28. — RESULTS OF MAGNETIC OBSERVATIONS.

Tyôsen (朝鮮)

No.	Station Name	Position Latitude	Position Longitude	Relation to former surveys	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
142	Kôkan (黃澗)	36 13.4	127 54.5	A	33.46	5 48.5	51 19.5	30661	30504	3103	38305
143	Hokô (浦項)	36 02.8	129 22.6	C	.45	5 52.3	50 57.3	30563	30403	3127	37682
144	Sinsyû (晋州)	35 11.2	128 05.5	B	32.37	5 19.3	50 08.6	31070	30936	2882	37217
145	Moppo (木浦)1	34 47.1	126 23.1	N	32.40	5 17.0	49 48.9	31364	31231	2888	37134
146	〃 (〃)2	34 46.7	126 23.5	A	.39	4 59.8	49 52.3	31403	31284	2735	37255
147	Kôkô (高興)	34 36.3	127 17.1	A	.39	5 08.3	49 50.9	31133	31008	2788	36904
148	Kwan Tô (莞島)	34 18.5	126 45.7	A	30.65	4 54.3	48 56.9	31523	31408	2695	36197
149	*Seizan Tô (青山島)	34 11.8	126 59.6	N	.61	4 26.4	49 13.2	31105	31012	2408	36061
150	Saisyû (濟州)1	33 30.7	126 31.9	N	32.42	4 59.5	49 09.0	31147	31029	2710	36021
151	〃 (〃)2	33 30.7	126 31.5	B	.40	4 24.7	47 58.0	31939	31844	2457	35430
152	Zyôsanpo (城山浦)	33 27.3	126 56.0	N	.41	4 18.5	47 54.0	32164	32073	2416	35597
153	Sôki Po (西歸浦)	33 14.4	126 34.1	N	.41	4 22.2	47 37.2	32506	32411	2477	35624
154	Mosippo (慕瑟浦)	33 13.5	126 15.5	N	.41	5 03.2	47 38.5	32603	32476	2872	35757

* See page 63.

Izu Syotô (伊豆諸島)

No.	Station Name	Position Latitude	Position Longitude	Relation to former surveys	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
155	Senzu, Ô Sima (大島泉津)	34 46.6	139 24.7	B	33.12	6 40.9	49 00.1	29523	29323	3435	33964
156	Motomura, 〃 (〃 元村)	34 45.0	139 21.5	B	.12	4 01.6	49 30.1	31339	31262	2201	36695
157	Mabusi, 〃 (〃 間伏)	34 41.4	139 23.3	B	.11	4 42.7	47 08.5	31171	31066	2560	33593
158	Habu, 〃 (〃 波浮)	34 41.0	139 26.6	B	.11	7 11.4	48 37.7	30898	30655	3867	35082
159	Wakagô, Nî Sima (新島若郷)	34 25.0	139 17.1	N	.10	4 27.3	47 21.1	30543	30451	2373	33159
160	Honmura, 〃 (〃 本村)	34 22.1	139 15.8	N	.09	4 17.8	46 56.1	30744	30658	2303	32894
161	Ôkubo, Miyake Sima (三宅島大久保)	34 07.0	139 31.0	N	.08	5 19.9	46 12.1	31412	31276	2919	32758
162	Akabakke, 〃 (〃 赤場曉)	34 06.1	139 33.8	N	.07	3 49.9	44 03.0	31349	31279	2095	30326
163	Ako, 〃 (〃 阿古)	34 04.1	139 29.0	N	.07	5 46.6	48 20.0	29400	29251	2959	33036
164	Tubota, 〃 (〃 坪田)	34 03.4	139 34.1	N	.07	5 39.3	48 03.2	30217	30070	2978	33622
165	Mitune, Hatizyô Sima (八丈島三根)	33 07.2	139 48.4	N	.04	5 00.9	45 45.7	30234	30118	2643	31049
166	Ôgagô, 〃 (〃 大賀郷)	33 06.0	139 47.3	N	.05	5 51.5	44 38.7	31435	31271	3209	31048
167	Nakanogô, 〃 (〃 中之郷)	33 03.8	139 49.1	N	.05	5 48.6	46 52.0	31101	30941	3148	33197

Ogasawara Guntô (小笠原群島)

No.	Station Name	Position Latitude	Position Longitude	Relation to former surveys	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
168	Okumura, Titi Sima (父島奥村)	27 05.8	142 12.1	A	33.03	2 43.7	36 57.8	32124	32088	1529	24175
169	Ômura, 〃 (〃 大村)1	27 05.4	142 11.3	N	.05	2 43.0	37 22.9	31963	31927	1515	24421
170	〃 〃 (〃 〃)2	27 05.3	142 11.2	B	.03	2 42.4	37 34.0	32080	32044	1515	24675
171	Ôgiura, 〃 (〃 扇浦)	27 04.2	142 12.0	B	.04	3 14.1	37 39.2	32335	32284	1825	24949
172	Susaki, 〃 (〃 洲崎)	27 04.1	142 11.2	N	.04	2 16.3	37 47.8	31939	31914	1266	24772
173	Kitamura, Haha Sima (母島北村)	26 41.5	142 08.4	A	33.06	2 39.7	36 56.4	31882	31848	1481	23972
174	Higasi Minato, 〃 (〃 東港)	26 41.4	142 08.5	A	.07	2 40.8	37 05.9	32269	32234	1509	24403
175	Nagahama, 〃 (〃 長濱)	26 40.3	142 08.5	N	.08	2 38.5	35 43.5	32488	32454	1497	23366
176	Okimura, 〃 (〃 沖村)	26 38.1	142 09.4	A	.09	2 22.6	36 53.5	32466	32438	1346	24369
177	Minami Saki, 〃 (〃 南崎)	26 36.3	142 10.3	A	.07	2 28.0	37 13.6	32293	32263	1390	24536
178	Oki-no-Tori Sima (沖ノ鳥島)1	20 25.6	136 03.8	N	.31	0 51.5	27 08.0	34602	34598	518	17732
179	〃 (〃)2	20 25.4	136 03.8	N	.31	0 54.1	27 06.9	34588	34584	544	17711

Nansei Syotô (南西諸島)

No.	Station Name	Position Latitude	Position Longitude	Relation to former surveys	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
180	Naha (那覇)1	26 12.6	127 40.1	B	32.46	2 51.3	36 56.9	34748	34705	1731	26135
181	〃 (〃)2	26 12.1	127 39.9	N	.46	2 43.0	37 05.1	34672	34633	1643	26208
182	Miyako (宮古)	24 48.5	125 16.9	A	.48	2 10.3	34 54.6	35383	35358	1341	24693
183	Isigaki (石垣)	24 19.9	124 09.9	C	.50	1 59.4	34 08.9	35713	35692	1240	24223

Taiwan (臺灣)

No.	Station Name	Position Latitude	Position Longitude	Relation to former surveys	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
184	Taihoku (臺北)	25 02.4	121 30.4	C	32.60	2 08.7	35 17.8	35954	35929	1346	25454
185	Karenkô (花蓮港)	23 58.7	121 36.4	A	.54	1 26.0	33 39.6	36073	36062	902	24021
186	Hôko Tô (澎湖島)1	23 34.3	119 33.8	A	.58	1 01.6	32 48.3	36298	36292	650	23397
187	〃 (〃)2	23 34.2	119 33.7	N	.59	1 27.7	32 45.8	36339	36327	927	23386
187′	〃 (〃)2′	23 34.1	119 33.5	N	.58	.....	32 43.1	36712	.....	.....	.....
188	〃 (〃)3	23 34.0	119 33.4	N	.58	1 22.5	32 44.8	36670	36659	880	23584
189	Toapanrâ (大板埠)	21 57.7	120 45.3	A	.55	1 03.1	29 51.2	36915	36909	677	21187

Mariana Syotô (Mariana Islands) (マリアナ諸島)

No.	Station Name	Position Latitude	Position Longitude	Relation to former surveys	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
190	Mongu Tô (モウグ島)1	20 01.7	145 14.0	N	32.69	3 05.4	25 02.1	33866	33817	1825	15817
191	〃 (〃)2	20 00.8	145 13.1	N	.69	6 46.5	32 50.3	31305	31086	3693	20204
192	Pagan Tô (パガン島)1	18 07.8	145 45.9	N	.76	−0 04.8	24 44.6	33354	33354	− 47	15372
193	〃 (〃)2	18 07.6	145 46.0	A	.71	−0 30.8	22 40.4	33434	33433	− 300	13967
194	Saipan Tô (サイパン島)1	15 13.5	145 46.0	N	.67	−1 43.1	17 24.6	34383	34368	−1031	10781
195	〃 (〃)2	15 13.1	145 43.3	A	.65	−1 47.9	17 17.0	34460	34443	−1081	10722
196	〃 (〃)3	15 09.3	145 44.9	A	.75	−1 41.0	17 12.7	34469	34454	−1013	10677
197	Rota Tô (ロタ島)	14 08.4	145 08.8	N	.66	−1 52.1	15 07.0	34770	34752	−1134	9392

Nisi-Karorin Syotô (West Caroline Islands) (西カロリン諸島)

No.	Station Name	Position Latitude	Position Longitude	Relation to former surveys	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
198	Urusi Tô (ウルシ島)	10 02.3	139 46.2	N	33.48	−1 55.8	6 47.3	36358	36337	−1225	4328
199	Yappu Tô (ヤップ島)	9 31.4	138 08.5	A	.42	−1 52.6	5 35.4	36809	36789	−1205	3592
200	Kurrû Tô (クツルー島)	8 17.9	137 29.3	N	.33	−2 10.6	3 23.1	36913	36886	−1402	2183
201	Korôru Tô, Parao Syotô (パラオ諸島)1	7 20.2	134 30.2	A	.35	−2 05.7	0 45.6	37262	37237	−1362	494
202	〃 〃 (コロール島)2	7 20.0	134 29.0	A	.35	−2 07.9	1 11.0	37487	37461	−1395	774
203	Marakaru Tô, 〃 (〃 マラカル島)	7 19.9	134 27.7	A	.36	−2 20.9	0 59.8	37511	37479	−1537	653
204	Tokobei Tô (トコベイ島)	3 00.8	131 06.5	N	.39	−2 38.2	−8 50.0	38152	38112	−1755	−5929

Table 28. — RESULTS OF MAGNETIC OBSERVATIONS.

Higasi-Karorin Syotô (East Caroline Islands) (東カロリン諸島)

No.	Station Name	Position Latitude	Position Longitude	Relation to former survey	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
205	Hurasarappu Tô (フラッラップ島)	8 35.9	144 33.2	N	33.53	−2 37.7	4 33.6	36094	36056	−1655	2879
206	Orôru Tô (オロール島)	8 35.0	149 39.5	A	.52	−3 56.1	5 21.6	35242	35159	−2418	3306
207	Nomuuin Tô (ノムウイン島)	8 25.9	151 44.3	N	23.7	−4 23.7	5 05.4	35709	35604	−2736	3181
208	Kita Sima, Torakku Syotô (トラック諸島 北島)	7 42.3	151 44.7	N	.59	−4 22.3	3 37.3	35597	35493	−2714	2253
209	Matu Sima, 〃 (〃 松島)	7 22.6	151 53.7	A	.00	−5 22.6	0 51.7	33982	33832	−3184	511
210	Take Sima, 〃 (〃 竹島)	7 21.4	151 53.3	A	.52	−3 33.0	1 57.0	35536	35767	−2219	1220
211	Oda Sima, 〃 (〃 小田島)	7 09.0	151 53.9	N	.56	−4 00.2	3 02.1	35385	35299	−2470	1876
212	Ororukku Tô (オロルック島)	7 37.6	155 09.7	N	32.63	−4 32.7	2 49.7	34434	34326	−2729	1701
213	Namotikku Tô (ナモチック島)	7 27.7	146 23.4	N	33.50	−3 17.5	2 17.6	35761	35702	−2053	1432
214	Mereyon Tô (メレヨン島)	7 22.3	143 54.3	A	.50	−3 00.0	1 43.2	36285	36235	−1899	1090
215	Ponape Tô (ポナペ島)	7 00.4	158 13.8	N	.04	−6 13.2	3 28.5	34709	34505	−3761	2108
216	〃 〃 2	6 58.1	158 12.7	N	32.61	−4 47.8	2 07.2	34594	34473	−2893	1281
217	〃 〃 3	6 55.8	158 18.1	N	33.66	−6 14.9	3 31.5	35086	34878	−3819	2161
218	〃 〃 4	6 55.0	158 05.8	N	32.59	−5 44.9	4 06.9	35028	34852	−3508	2520
219	〃 〃 5	6 51.4	158 20.8	N	.60	−6 06.1	2 13.1	34755	34558	−3694	1346
220	〃 〃 6	6 48.5	158 15.5	N	.60	−6 06.2	1 35.9	35247	35047	−3747	983
221	〃 〃 7	6 47.9	158 09.4	A	.60	−6 00.2	2 27.6	34929	34738	−3653	1501
222	Rôsoppu Tô (ローソップ島)	6 53.6	152 44.1	A	33.57	−4 40.4	1 20.8	35033	34917	−2854	824
223	Kusai Tô (クサイ島)	5 20.2	163 01.2	A	32.40	−6 50.1	2 02.1	34687	33845	−4057	1211
224	Satôwan Tô (サトウアン島)	5 20.1	153 44.1	A	33.62	−5 10.3	−0 53.4	35525	35380	−3202	−552
225	Nugôru Tô (ヌゴール島)	3 59.0	154 59.4	N	.65	−5 46.7	−4 02.6	35414	35234	−3505	−2503
226	Gurâmitti Tô (グリーニッチ島)	1 04.6	154 48.0	N	.66	−5 34.5	−9 22.4	36189	36018	−3516	−5973

Mâsyaru Syotô (Marshall Islands) (マーシャル諸島)

No.	Station Name	Position Latitude	Position Longitude	Relation to former survey	Date	Elements of Terrestrial Magnetism: Declination	Dip	Horizontal Intensity	X	Y	Z
		° ′	° ′			° ′	° ′	γ	γ	γ	γ
227	Pôkaakku Tô (ポカアック島)	14 34.1	168 57.4	N	32.56	−8 04.9	21 16.2	31467	31155	−4424	12249
228	Pikâru Tô (ピカール島)	12 14.9	170 07.7	N	.54	−8 44.0	16 05.8	31528	31163	−4787	9098
229	Eniwetakku Tô (エニワエタック島)	11 20.6	162 20.5	A	.37	−6 17.2	12 03.0	33129	32930	−3628	7072
230	Uterokku Tô (ウトロック島)	11 14.2	169 51.3	N	.47	−8 02.4	14 23.4	33434	33105	−4076	8578
231	Rongorappu Tô (ロンゴラップ島)	11 08.9	166 53.6	A	.58	−7 25.9	13 18.8	32290	32019	−4176	7041
232	Airukku Tô (アイルック島)	10 12.9	169 58.9	N	.53	−7 39.4	12 47.8	33268	32971	−4433	7556
233	Wozzie Tô (ウオッジェ島)	9 28.2	170 28.2	N	.33	−8 29.3	12 06.0	33440	33074	−4936	7169
234	Kuezyerin Tô (クェジェリン島)	8 44.5	167 44.4	N	.46	−7 41.3	8 50.2	33389	33089	−4467	5191
235	Mire Tô (ミレー島)	6 04.9	171 44.4	N	.52	−9 08.9	6 04.0	34128	33694	−5426	3627
236	Yarûto Tô (ヤルート島)	5 54.9	169 39.1	A	.43	−8 10.7	4 35.8	34126	33779	−4854	2744

RESULTS OF AUXILIARY MAGNETIC OBSERVATIONS MADE BY THE DEPARTMENT AFTER THE SURVEY, 1922—23.

Besides the present decennial magnetic survey, the several auxiliary magnetic observations were made after the last survey; at Sio-no-Misaki in Honsyû in February 1927; in Seizan Tô in the south coast of Tyôsen during July-August 1930; in Manchoukuo during 1932—34. The observers, number of occupied stations, etc. are as in Table 29.

Among the above, the observations in Seizan Tô and its neighbouring islands were made with the object of investigating the local anomalies in those regions (See "The Hydrographic Bulletin, 10th. Year No. 11, 1931 pages 437—447.") and here the results are shown in Table 30. The results of other auxiliary magnetic observations are included in Tables 28 and 50. In Table 30, each value of magnetic elements is the mean value of two or more direct observed values at a station. The value for each column for the station designated as Seizan Tô in Table 28 is some mean of the data except those of Kwan Tô, given in Table 30, magnetic results being subjected to the instrumental corrections.

Table 29.—Summary showing the auxiliary magnetic observations.

Place	Member	Period of observation	Number of Stations	Instrument
Sio-no-Misaki (潮ノ岬)	A. Muramoto E. Hurukawa	Feb. 27, 1927 — Feb. 28, 1927 〃 〃 〃 — 〃 〃 〃	1	Kew No. 11 D. C. No. 3
Seizan Tô (青山島)	A. Muramoto S. Kuwahara	July 29, 1930 — Aug. 25, 1930 〃 〃 〃 — 〃 〃 〃	22	Mag. No. 4
Manchoukuo (滿洲國)	K. Kobayasi K. Nagoya	May 20, 1932 — May 28, 1932 〃 〃 〃 — 〃 〃 〃	3	Kew No. 11 D. C. No. 3
	I. Yamakawa K. Nagoya R. Hirata J. Yosida	May 11, 1933 — May 17, 1933 〃 〃 〃 — Sep. 15, 1933 May 17, 1933 — 〃 〃 〃 Aug. 26, 1933	6	Kew No. 12 D. C. No. 2
	H. Asahina G. Oka	June 3, 1933 — Aug. 15, 1933 〃 〃 〃 — 〃 〃 〃	3	Kew No. 11 D. C. No. 5
	K. Kudô S. Urai	Sep. 27, 1934 — Oct. 1, 1934 〃 〃 〃 — 〃 〃 〃	1	Mag. No. 3

TABLE 30

RESULTS OF MAGNETIC OBSERVATIONS IN SEIZAN TÔ AND ITS NEIGHBOURING ISLANDS, TYÔSEN IN 1930.

Station	Position: Latitude	Position: Longitude	Position: Height	Date	Declination: Time	Declination: Observed Value	Dip: Time	Dip: Observed Value	Horizontal Intensity: Time	Horizontal Intensity: Observed Value
	° ′	° ′	m		h m	° ′	h m	° ′	h m	
Kwan Tô (莞 島)	34 18.5	126 45.7	9	July 29	15 20	5 01.1	12 08	48 52.1	16 14	31513
				〃 30	.....	.....	.....	.....	.....	.....
				〃 30	15 22	5 03.4	13 21	48 52.2	16 00	31515
Kukufanie, Chonsan Tô (青山島新花里)	34 12.7	126 53.5	35	Aug. 20	9 10	5 45.5	12 26	49 59.0	9 44	30987
Neihan Tô, 〃 〃 (〃 内項島)	34 12.6	126 54.8	16	〃 23	9 32	5 56.4	10 39	49 08.2	10 07	31549
Kukusanmie, 〃 〃 (〃 新山里)	34 12.0	126 54.2	11	〃 13	16 09	5 00.4	17 03	48 54.8	16 30	31546
Tinie, 〃 〃 (〃 池 里)	34 11.8	126 51.9	11	〃 12	7 55	4 53.1	9 41	49 41.5	8 25	31200
Sinhunnie, 〃 〃 (〃 新興里)	34 11.3	126 54.5	67	〃 5	7 31	4 11.3	9 07	48 52.9	8 07	31851
Teiponsan, 〃 〃 (〃 大鳳山)	34 11.2	126 53.5	373	〃 15	10 24	3 27.8	11 29	50 53.4	10 54	30435
Han Tô, 〃 〃 (〃 頂 島) 1	34 11.1	126 55.6	70	〃 7	7 34	4 46.3	8 33	49 14.2	8 00	31358
〃 〃 〃 2	34 11.1	126 55.3	15	〃 8	7 36	5 15.2	9 17	49 16.3	8 02	31364
				〃 8	8 41	5 05.8	.....	.....	.....	.....
				〃 8	12 09	5 13.7	.....	.....	.....	.....
Totyonnie, 〃 〃 (道清里)	34 10.8	126 51.6	15	〃 1	6 28	5 01.1	9 45	48 52.4	7 11	31600
Tontyonnie, 〃 〃 (東村里)	34 10.7	126 54.8	30	〃 17	12 31	5 03.9	13 31	49 04.6	13 04	31468
Tonakunie, 〃 〃 (堂洛里)	34 09.9	126 52.6	68	〃 4	7 32	4 24.1	8 44	49 29.6	8 06	31076
Meiponsan, 〃 〃 (鷹峰山) 1	34 09.7	126 55.2	48	〃 6	7 34	4 22.7	8 46	49 04.5	8 05	31445
Kuondokupo, 〃 〃 (福德浦)	34 09.1	126 53.2	50	〃 2	6 21	4 48.6	10 48	49 06.2	7 04	31435
Meiponsan, 〃 〃 (鷹峰山) 2	34 09.0	126 54.6	36	〃 3	7 11	4 42.5	8 28	49 05.1	7 44	31447
Toayû Tô (牛 島)	34 14.6	127 01.0	50	〃 11	7 34	5 17.5	8 37	48 57.3	8 00	31195
Karuku Tô (加 久 島) 1	34 13.2	127 00.9	27	〃 10	8 07	4 06.1	9 03	49 58.1	8 32	30832
〃 (渦 〃) 2	34 13.1	127 00.5	147	〃 19	9 55	5 43.0	11 16	53 11.6	10 32	30612
Mamuri Tô (每 物 島)	34 12.9	126 59.5	98	〃 9	8 46	1 07.4	10 00	50 42.1	9 23	30960
Son Tô (添 足 島) 1	34 12.7	127 00.7	59	〃 19	15 20	5 44.8	16 34	50 13.7	15 48	30904
〃 〃 2	34 12.3	127 00.6	5	〃 18	9 54	4 31.1	10 46	48 46.0	10 16	31655
Hanchei Tô (黄 堤 島)	34 11.4	127 04.4	60	〃 16	15 31	4 08.9	17 04	47 53.9	15 57	30907

SPECIAL REPORTS.

Results of Magnetic Observations Made by the Department during Solar Eclipses.

On the days of the total solar eclipse of September 1, 1932 and the annular eclipse of August 21, 1933, the field parties of the Department made the continuous and rather precise magnetic observations (declination only) at each expedient station, while engaging in this survey. In Japan, however, only the eclipse of the former was seen in the north end of Tisima Rettô and that of the latter in the south-eastern part of Japan and Nanyô Guntô (South Sea Islands) under Japanese Mandate. Therefore, all the stations at which the observations were made were situated at great distances from the central lines of both the total and annular eclipses.

Circumstances of the eclipses.

	A total eclipse of Sept. 1, 1932.			An annular eclipse of Aug. 21, 1933.		
	C.S.T. 135°E	Longitude	Latitude	C.S.T. 135°E	Longitude	Latitude
	h m	° ′	° ′	h m	° ′	° ′
Eclipse begins	2 44.5	169 18E	59 15N	11 52.1	41 00E	28 26N
Central eclipse begins	4 04.2	109 16E	79 36N	12 55.5	24 38E	30 11N
Central eclipse at local apparent noon	4 16.8	109 10W	78 36N	14 44.0	94 48E	17 55N
Central eclipse ends	6 02.6	40 59W	28 27N	16 42.0	150 38E	20 31S
Eclipse ends	7 22.1	64 45W	5 00N	17 45.3	134 21E	22 16S

The observers and the stations are as in the following table, the magnetic results being given in Tables 31—35.

Stations of magnetic observations during solar eclipses.

Date	Stations	Latitude	Longitude	Observers
		° ′ ″	° ′ ″	
Sept. 1st 1932	Maoka, Karahuto	47 02 30	143 02 49	A. Muramoto, S. Urai
	Imaiti, Honsyû	35 21 40	132 45 12	T. Ogawa, S. Hayami
	Saipan Tô, Mariana Syotô	15 13 30	145 45 57	S. Kuwahara, S. Tanaka
Aug. 21st 1933	Chiangchiao, Manchoukuo	46 43 16	123 39 48	K. Nagoya, R. Hirata
	Ponape Tô, Higasi-Karorin Syotô	7 00 22	158 13 50	S. Kuwahara, S. Urai

As the principal object of these observations have been to examine the change of declination during the solar eclipse, the change was observed by the displacement of the reflected image of the central line of the scale in the auto-collimating telescope, increasing the sensibility of the magnetometer. The period of oscillation of the suspended magnet of the mirror magnetometer was increased to twice that in usual cases to read to one second of arc in declination. Throughout the continuous observation, all parts of the magnetometer-theodolite were kept fixed for fear of changing the conditions of the instrument, and on the other hand to save the time of individual observations. However, the error in declination due to the nonconformity in direction between the geometrical axis and the magnetic axis of the coil is eliminated from the results. The correction for this error was determined directly before the commencement of the continuous observation, and assumed to be constant throughout the observation. Each observed value, therefore, is an instantaneous one, and moreover, as the watch was strictly corrected by means of the time-signals by wireless, the time of each observation shown in the tables is correct to about one second in general. But, the results at Imaiti in Honsyû and Saipan in Mariana Syotô are obtained by the standard method of determination of declination and therefore one or two minutes were spent for each of those results. The observations at Chiangchiao were made by the Kew magnetometer, reversing the magnet, and 5—7 minutes were taken for each result. Hence, in the latter tables, the time of observation of each magnetic result is represented in reasonable accuracy according to the circumstances of the observations.

The results shown in Tables 31—35 are direct observed values, and if it is necessary to correct those values on the International or on the Kakioka Magnetic Standards, the corrections in Tables 23—26 should be applied.

The times of observations are referred to Japanese Central Standard Time, 9 hours fast of Greenwich.

Table 31.—RESULTS OF DECLINATION OBSERVATIONS DURING THE SOLAR ECLIPSE OF SEPTEMBER 1, 1932 AT MAOKA (眞　岡).

Lat: 47° 02′ 30″ N., Long: 142° 02′ 49″ E. Height: 26 m.

Date: September 1, 1932. Observer: A. Muramoto

Magnetometer: No. 5, Coil A, Magnet C. 〃 : S. Urai

W 9° +

Time	Dec.	Time	Dec.	Time	Dec.	Time	Dec.
h m s	′	h m s	′	h m s	′	h m s	′
2 19 07	11.85	3 29 59	11.83	5 19 59	10.00	7 04 59	11.38
2 23 31	11.95	3 34 59	12.08	5 29 59	9.95	7 09 59	11.38
2 27 28	11.90	3 39 59	11.83	5 34 59	9.88	7 15 59	10.93
2 30 52	11.90	3 44 59	11.58	5 39 59	10.08	7 16 59	10.93
2 34 07	11.93	3 49 59	11.58	5 45 59	9.93	7 17 59	10.87
2 39 01	11.78	3 54 59	11.58	5 49 59	9.78	7 18 59	10.80
2 41 07	11.93	3 59 59	11.68	5 54 59	9.98	7 19 59	10.78
2 41 55	11.93	4 00 59	11·73	5 56 59	10.03	7 20 59	10.75
2 43 01	11.93	4 01 59	11.78	5 57 59	10.03	7 21 09	10.73
2 43 39	11.98	4 02 59	11.82	5 58 59	10.05	7 21 19	10.75
2 43 59	11.98	4 03 09	11.82	5 59 59	10.05	7 21 29	10.75
2 44 09	11.98	4 03 19	11.82	6 00 59	10.05	7 21 39	10.75
2 44 19	11.98	4 03 29	11.82	6 01 09	10.05	7 21 49	10.75
2 44 24	12.00	4 03 39	11.83	6 01 19	10.05	7 21 59	10.75
2 44 29	11.98	4 03 49	11.83	6 01 29	10.05	7 22 09	10.75
2 44 39	12.00	4 03 59	11.82	6 01 39	10.05	7 22 19	10.75
2 44 49	12.00	4 04 09	11.82	6 01 49	10.07	7 22 29	10.75
2 44 57	12.02	4 04 19	11.83	6 01 59	10.07	7 22 39	10.72
2 44 59	12.00	4 04 29	11.82	6 02 09	10.07	7 22 49	10.72
2 45 09	12.00	4 04 39	11.82	6 02 19	10.10	7 22 59	10.75
2 45 19	12.02	4 04 49	11.82	6 02 29	10.10	7 23 09	10.75
2 45 32	12.02	4 04 59	11.83	6 02 39	10.05	7 23 19	10.73
2 45 39	12.03	4 05 09	11 85	6 02 49	10.05	7 23 29	10.75
2 45 47	12.02	4 05 19	11.83	6 02 55	9.98	7 23 39	10.75
2 45 49	12.02	4 05 29	11.82	6 03 09	9.98	7 23 49	10.75
2 45 57	12.02	4 05 39	11.82	6 03 19	9.97	7 23 59	10.75
2 45 59	12.02	4 05 49	11·80	6 03 29	9.95	7 24 09	10.77
2 46 04	12.00	4 05 59	11.80	6 03 39	9.93	7 24 59	10.80
2 46 12	12.02	4 06 09	11.83	6 03 49	9.95	7 26 59	11.02
2 46 19	12.02	4 06 59	11.87	6 03 59	9.95	7 27 59	11.00
2 46 24	12.02	4 07 59	11.90	6 04 09	9.92	7 28 59	11.03
2 46 34	12.02	4 08 59	11.92	6 04 59	9.92	7 29 59	11.07
2 46 39	12.02	4 09 59	11.93	6 05 59	9.93	7 32 59	11.02
2 46 49	12.02	4 10 09	11.92	6 06 59	9.78	7 33 59	11.05
2 47 09	12.03	4 10 59	11.93	6 07 59	9.78	7 34 59	11.08
2 48 59	11.93	4 14 59	11.43	6 09 59	10.28	7 35 59	10.72
2 49 59	11.93	4 19 59	11.38	6 14 59	10.53	7 36 59	11.07
2 50 59	11.93	4 24 59	11.23	6 19 59	10.58	7 37 59	11.03
2 54 59	11.88	4 29 59	11.18	6 24 59	10.88	7 38 59	11.00
3 00 19	11.83	4 39 59	10.85	6 29 59	11.08	7 39 59	10.93
3 04 59	11.83	4 49 59	10.77	6 40 24	11.17	7 44 59	10.73
3 09 59	11.83	4 59 59	10.45	6 49 47	11.30	7 49 59	10.23
3 19 59	11.87	5 09 59	10.40	6 59 59	11.18	7 56 49	10.53

Table 32.—RESULTS OF DECLINATION OBSERVATIONS DURING THE SOLAR ECLIPSE OF SEPTEMBER 1, 1932 AT IMAITI (今　市).

Lat: 35° 21′ 40″ N., Long: 132° 45′ 12″ E. Height: 9 m.

Date: September 1, 1932. Observer: T. Ogawa

Magnetometer: No. 4, Coil B, Magnet C. 〃 : S. Hayami

W 5° +

Time	Dec.	Time	Dec.	Time	Dec.	Time	Dec.
h m	′	h m	′	h m	′	h m	′
2 11.5	55.85	3 48.1	55.75	5 16.4	54.80	6 45.7	54.25
2 26.7	56.05	3 55.2	55.70	5 26.6	54.75	6 55.9	54.15
2 36.0	56.05	4 06.3	55.75	5 36.2	54.65	7 07.6	54.05
2 46.6	55.85	4 14.5	55.65	5 46.3	54.55	7 17.1	53.85
2 55.4	55.95	4 26.7	55.55	5 55.7	54.45	7 27.0	53.50
3 06.1	55.95	4 35.8	55.35	6 06.9	54.65	7 37.5	53.25
3 18.8	56.05	4 44.7	55.35	6 16.0	54.10	7 46.5	53.40
3 25.8	56.15	4 56.3	55.15	6 26.9	54.40	7 55.1	53.35
3 35.2	56.15	5 06.5	55.05	6 36.4	54.25	8 14.0	53.55

Table 33. — RESULTS OF DECLINATION OBSERVATIONS DURING THE SOLAR ECLIPSE OF SEPTEMBER 1, 1932 AT SAIPAN TÔ (サイパン島).

Lat: 15° 13′ 30″ N., Long: 145° 45′ 57″ E. Height: 207 m.

Date: September 1, 1932. Observer: S. Kuwahara

Magnetometer: No. 3, Coil B, Magnet B. 〃 : S. Tanaka

E 1° +

Time	Dec.	Time	Dec.	Time	Dec.	Time	Dec.
h m	′	h m	′	h m	′	h m	′
0 00.7	41.80	3 09.7	42.70	5 00.0	43.50	6 50.2	45.10
0 59.7	42.30	3 20.0	42.70	5 10.5	43.70	7 00.0	45.00
1 30.6	42.50	3 30.0	42.90	5 20.0	44.40	7 10.0	44.80
2 00.7	42.40	3 40.7	43.00	5 29.7	44.70	7 20.0	44.60
2 10.0	42.50	3 50.3	43.10	5 40.0	44.70	7 22.1	44.40
2 20.4	42.50	4 00.0	43.00	5 50.0	44.90	7 30.0	44.40
2 30.5	42.70	4 10.0	42.80	6 00.0	44.90	7 40.0	44.00
2 39.9	42.70	4 20.3	42.90	6 10.5	45.00	7 49.9	43.50
2 44.5	42.70	4 30.0	43.00	6 20.0	45.00	8 01.2	42.50
2 49.7	42.70	4 40.0	43.20	6 30.0	45.00		
3 00.0	42.70	4 50.0	43.30	6 40.0	45.00		

Table 34.—RESULTS OF DECLINATION OBSERVATIONS DURING THE SOLAR ECLIPSE OF AUGUST 21, 1933 AT CHIANGCHIAO (江　橋).

Lat: 46° 43′ 16″ N., Long: 123° 39′ 48″ E. Height: ——

Date: August 21, 1933. Observer: K. Nagoya

Kew Magnetometer: No. 12. 〃 : R. Hirata

W 8° +

Time	Dec.	Time	Dec.	Time	Dec.	Time	Dec.
h m	′	h m	′	h m	′	h m	′
8 06	13.60	12 04	22.93	14 34	20.77	17 04	18.18
9 07	15.02	12 34	23.27	15 03	19.85	18 04	16.90
10 03	16.68	13 05	22.23	15 37	19.43	18 34	16.10
11 04	20.60	13 35	16.60	16 03	19 43		
11 34	22.27	14 10	21.68	16 33	18.93		

Table 35. — RESULTS OF DECLINATION OBSERVATIONS DURING THE SOLAR ECLIPSE OF AUGUST 21, 1933 AT PONAPE TÔ (ポナペ島).

Lat: 7° 00′ 22″ N., Long: 158° 13′ 50″ E. Height: 1 m.

Date: August 21, 1933. Observer: S. Kuwahara

Magnetometer: No. 3, Coil A, Magnet C. 〃 : S. Urai

E 6° +

Time	Dec.	Time	Dec.	Time	Dec.	Time	Dec.
h m s	′	h m s	′	h m s	′	h m s	′
8 01 45	8.70	11 44 59	7.70	11 51 57	7.80	11 59 03	7.90
9 00 42	7.50	11 45 59	7.70	11 52 47	7.80	11 59 59	7.90
9 59 46	6.85	11 46 59	7.70	11 53 29	7.80	12 04 59	7.90
10 30 18	7.10	11 47 59	7.70	11 54 11	7.80	12 09 59	7.90
10 59 59	7.30	11 48 59	7.75	11 54 44	7.80	12 19 59	8.10
11 20 01	7.50	11 49 59	7.70	11 55 13	7.80	12 29 59	8.30
11 29 59	7.50	11 50 19	7.70	11 55 59	7.80	12 34 59	8.50
11 37 43	7.50	11 51 08	7.75	11 56 59	7.80	12 39 59	8.50
11 39 59	7.60	11 51 31	7.80	11 57 59	7.90	12 44 59	8.70

Table 35.—RESULTS OF DECLINATION OBSERVATIONS DURING THE SOLAR ECLIPSE OF AUGUST 21, 1933 AT PONAPE TÔ (ポナペ島).—Continued.

E 6° +

Time	Dec.	Time	Dec.	Time	Dec.	Time	Dec.
h m s	/	h m s	/	h m s	/	h m s	/
12 45 59	8.70	13 45 44	9.75	15 20 26	10.90	16 45 17	10.55
12 46 59	8.70	13 46 02	9.75	15 29 59	10.05	16 45 59	10.55
12 47 59	8.70	13 46 59	9.80	15 39 59	10.00	16 46 59	10.55
12 48 59	8.80	13 47 59	9.80	15 50 21	10.90	16 47 59	10.55
12 50 05	8.80	13 49 02	9.80	15 52 44	10.75	16 48 59	10.55
12 50 59	8.80	13 49 59	9.80	15 53 43	10.60	16 49 59	10.55
12 51 59	8.80	13 50 59	9.85	15 54 49	10.55	16 54 59	10.55
12 52 59	8.90	13 51 59	9.85	15 56 01	10.55	16 59 59	10.50
12 53 29	8.90	13 52 59	9.85	15 57 04	10.55	17 09 59	10.50
12 53 55	8.90	13 54 07	9.85	15 58 31	10.55	17 19 59	10.50
12 54 22	8.90	13 55 09	9.90	15 59 01	10.55	17 24 39	10.35
12 54 58	8.95	13 59 59	9.90	15 59 31	10.55	17 29 59	10.35
12 55 42	8.95	14 09 59	10.05	16 00 31	10.55	17 34 59	10.35
12 56 11	9.00	14 14 59	10.10	16 01 59	10.55	17 35 59	10.35
12 57 33	9.10	14 19 59	10.25	16 04 59	10.55	17 36 59	10.35
12 57 59	9.10	14 25 15	10.40	16 06 43	10.55	17 37 59	10.35
12 59 14	9.10	14 29 59	10.50	16 07 59	10.55	17 38 59	10.35
13 00 03	9.10	14 34 59	10.50	16 09 59	10.55	17 39 59	10.35
13 00 59	9.20	14 35 59	10.55	16 10 59	10.55	17 40 59	10.35
13 01 59	9.20	14 36 59	10.55	16 11 59	10.55	17 41 59	10.35
13 02 59	9.20	14 37 59	10.55	16 12 59	10.55	17 42 59	10.35
13 03 59	9.30	14 38 59	10.55	16 13 59	10.55	17 43 29	10.35
13 05 04	9.30	14 39 59	10.60	16 14 59	10.55	17 43 59	10.35
13 06 05	9.30	14 40 59	10.60	16 15 59	10.55	17 44 29	10.35
13 09 59	9.35	14 41 59	10.65	16 17 31	10.55	17 44 59	10.35
13 19 59	9.50	14 42 35	10.65	16 18 59	10.55	17 45 29	10.35
13 24 59	9.50	14 43 19	10.65	16 19 59	10.55	17 45 59	10.35
13 29 59	9.60	14 43 51	10.70	16 20 59	10.55	17 46 29	10.35
13 34 59	9.65	14 44 15	10.70	16 21 59	10.55	17 46 59	10.35
13 35 59	9.65	14 44 38	10.75	16 22 59	10.55	17 47 29	10.35
13 36 59	9.65	14 45 01	10.75	16 24 59	10.55	17 47 59	10.35
13 37 59	9.70	14 45 33	10.75	16 29 56	10.55	17 48 59	10.35
13 38 59	9.70	14 46 19	10.75	16 34 59	10.50	17 49 59	10.40
13 39 59	9.70	14 46 59	10.75	16 36 09	10.55	17 50 59	10.40
13 40 59	9.70	14 47 59	10.75	16 36 59	10.55	17 51 59	10.40
13 41 59	9.70	14 48 59	10.75	16 37 59	10.55	17 52 59	10.40
13 42 29	9.70	14 49 59	10.75	16 39 44	10.55	17 53 59	10.40
13 42 42	9.70	14 50 59	10.75	16 40 59	10.55	17 54 59	10.50
13 43 04	9.70	14 51 59	10.75	16 41 28	10.50	17 59 59	10.50
13 43 25	9.70	14 52 59	10.75	16 42 06	10.55	18 04 59	10.70
13 43 48	9.70	14 53 59	10.75	16 42 41	10.55	18 15 19	10.65
13 44 14	9.70	14 54 59	10.75	16 43 14	10.55	18 38 19	10.65
13 44 37	9.70	14 59 59	10.90	16 43 34	10.55		
13 45 17	9.75	15 10 10	10.85	16 43 59	10.50		

Results of Observations for Investigating the Diurnal Variations of the Magnetic Elements at Rangâ in Ponape Tô.

At each station occupied by a field party of magnetic survey, declination has been observed at such short intervals of time (1 to 2 hours) during the observing days as possible to investigate its diurnal variation. However, as the observations of dip and horizontal intensity have been made only a few times a day spacing between them several hours, the materials for investigation of their diurnal variations covering the large area of Japan are very insufficient. Yet, in Japan Proper, the general aspect of the diurnal variations are known by these materials, referring to the complete data furnished by some observatories. In Nanyô Guntô (South Sea Islands) under Japanese Mandate, on the other hand, there had been no available data except the results of the magnetic surveys made by the Department, and the characters of the diurnal variations of the elements in these regions had not been made clear.

The field party in Nanyô Guntô, therefore, made the observation for investigating the actual diurnal variations of the elements at a station at Rangâ in Ponape Tô, in September, 1933. The observation was carried out in the following manner as there was only one magnetometer:—

The observations of declination and horizontal intensity were made successively, at intervals of one hour during an observing day, but that of dip was postponed to the following day. For, the arrangement of the instruments had to be entirely changed for it. In the individual observations of each element, the processes necessary for the elimination of the error in the result arising from the individuality and the imperfection of the adjustment of the instrument was omitted for fear of disturbing the condition of the instrument through the process of reversing the Helmholtz-Coil or Rotating-Coil, and moreover for the sake of simplifying the individual observation. However, the error is eliminated from the result by applying the correction determined before the commencement of the continuous observation. The results of observations are as in Table 36.

Though the diurnal variation of a magnetic element in the tropical regions may be greatly changed according to the season of the year in general, the above results may offer some materials for the investigation of the diurnal variations of the elements in Nanyô Guntô (South Sea Islands).

Table 36.—Results of Observations for Investigating the Diurnal Variations of the Magnetic Elements at Rangâ in Ponape Tô.

Lat: 7° 00′ 22″ N., Long: 158° 13′ 50″ E. Height: 1 m.

Date: September 10—12, 1933. Observer: S. Kuwahara, S. Urai.

Magnetometer: No. 3, Coil A, Mag. C, Cell 2, Resist. 1.

Declination

Time			Dec.	Time			Dec.	Time			Dec.	Time			Dec.	
th	h	m	° ′	th	h	m	° ′	th	h	m	° ′	th	h	m	° ′	
10	7	27.9	−5 53.3	10	14	59.6	−5 54.6	10	23	58.6	−5 53.8	11	8	59.1	−5 53.1	
10	7	31.7	−5 53.1	10	15	59.0	−5 54.2	11	0	59.9	−5 54.2	11	10	03.3	−5 51.2	
10	8	03.1	−5 52.4	10	16	58.3	−5 54.1	11	2	18.4	−5 54.1	11	11	04.5	−5 50.2	*
10	8	59.1	−5 51.3	10	17	59.7	−5 54.1	11	2	59.5	−5 54.6	11	12	04.0	−5 51.0	*
10	10	00.3	−5 50.9	10	18	59.4	−5 53.9	11	3	59.1	−5 54.9	11	13	06.5	−5 52.8	*
10	11	00.1	−5 50.6	10	20	01.2	−5 53.7	11	4	59.4	−5 55.7	11	14	10.3	−5 53.8	*
10	12	00.6	−5 51.3	10	21	03.3	−5 53.5	11	5	59.2	−5 56.4	11	15	00.0	−5 53.8	*
10	12	59.8	−5 52.2	10	22	03.7	−5 53.6	11	6	59.1	−5 55.3	11	15	18.2	−5 53.7	*
10	13	59.4	−5 53.4	10	23	02.7	−5 53.7	11	8	00.1	−5 54.6					

* with mirror magnetometer B.

Dip

Time			Dip	Time			Dip	Time			Dip	Time			Dip
th	h	m	° ′	th	h	m	° ′	th	h	m	° ′	th	h	m	° ′
11	15	50.7	3 37.5	11	20	59.3	3 40.8	12	5	04.0	3 40.7	12	13	01.1	3 40.4
11	15	57.3	3 38.2	11	22	00.0	3 40.8	12	6	03.7	3 39.4	12	13	58.7	3 40.4
11	16	01.2	3 38.0	11	23	09.8	3 41.4	12	6	56.8	3 38.9	12	15	00.3	3 40.8
11	16	04.6	3 38.1	11	23	57.6	3 41.4	12	8	00.3	3 37.5	12	15	59.6	3 41.0
11	17	03.3	3 41.0	12	0	57.8	3 41.4	12	8	56.0	3 37.5	12	16	58.9	3 39.8
11	17	58.8	3 41.6	12	2	00.5	3 40.4	12	9	58.3	3 37.6	12	17	58.9	3 40.8
11	19	00.0	3 39.6	12	2	59.9	3 40.0	12	10	59.3	3 40.9	12	18	57.6	3 40.6
11	20	00.0	3 40.4	12	3	58.1	3 41.5	12	11	59.1	3 41.6				

Horizontal Intensity

Time			Hor.	Time			Hor.	Time			Hor.	Time			Hor.	
th	h	m	γ	th	h	m	γ	th	h	m	γ	th	h	m	γ	
10	8	01.1	34554	10	17	04.1	34532	11	3	08.4	34536	11	9	06.1	34618	
10	8	13.8	34554	10	18	06.0	34536	11	4	05.8	34533	11	10	10.2	34595	
10	9	07.1	34538	10	19	06.1	34528	11	5	06.4	34533	11	11	11.3	34580	
10	10	06.4	34546	10	20	06.9	34526	11	6	09.5	34540	11	12	11.3	34572	*
10	11	08.0	34532	10	21	09.4	34538	11	7	09.5	34580	11	13	11.9	34561	*
10	12	07.9	34498	10	22	09.9	34533	11	7	25.0	34594	11	14	16.5	34554	*
10	13	07.7	34519	10	23	09.1	34540	11	7	31.6	34595	11	15	05.3	34552	*
10	14	05.8	34506	11	0	04.7	34538	11	7	47.4	34597					
10	15	05.7	34532	11	1	12.5	34534	11	8	06.5	34601					
10	16	06.3	34541	11	2	28.8	34533	11	8	35.8	34617					

* with mirror magnetometer B.

MAGNETIC CHARTS FOR 1933. 0

MAGNETIC CHARTS FOR 1933. 0.

INTRODUCTION.

The Department had published the magnetic charts for the epoch 1913. 0 and 1923. 0. The former charts are constructed on the basis of the materials obtained by the magnetic survey during 1912—13, and their extents are limited to Japan Proper and its close adjacent regions. The latter charts founding on the materials obtained by the magnetic survey of the Department during 1922—23, those given by the Carnegie Institution of Washington, and the Chinese Government, are extended to the area from 5° S to 60° N in latitude and from 115° E to 175° E in longitude.

The present magnetic charts are the third ones published by the Department and are constructed principally on the basis of the materials obtained by the Department during 1932—33, and those by the Carnegie Institution of Washington. The area covered by the charts is the same as that by the charts for 1923. 0. In constructing the magnetic charts, the annual changes of the magnetic elements were calculated in somewhat different manner as compared with in the case of the previous charts and the lines of equal annual change of each element are shown on the respective chart. However, in the case of the annual changes of dip and horizontal intensity, the lines are not so accurate as those of declination, owing to the lack of available materials.

The persons who co-operated in the preparation of the present magnetic charts are S. Kuwahara, S. Miyahara (from October 1933 to July 1934) and five assistants, M. Mituno, M. Nagata, R. Nakayama, N. Ôkubo and M. Seo.

In addition, Dr. S. Ogura, Naval Engineer, and Mr. N. Watanabe, the Director of the "Central Bureau of Weights and Measures", extended to us various important advices throughout the whole work.

PREPARATION OF MAGNETIC CHARTS FOR 1933. 0.

General Remarks.

In the present case, as described above, the area for which the magnetic chart should be constructed extends over large sea area from 5° S to 60° N in latitude and from 115° E to 175° E in longitude. Therefore, the data obtained by the magnetic surveys of the Department, which were restricted to land, are distributed to too small area to construct the chart for the whole area. The results in the North Pacific Ocean of the Ocean Magnetic Observations of the Carnegie Institution of Washington consist an important part of the data taken from the other sources. As these data are old, the observed values except those in 1929 should be reduced to the epoch of 1933.0 by applying the corrections of tolerable amount, to use them for the construction of our charts. The reduction was carried out in the following manner: —

It will be recognized by the latter discussion that the observed values of the magnetic element at a station in Japan and its neighbourhood could be sufficiently, in accuracy, represented by a quadratic function of time,

$$M_T = A + Bt + Ct^2,$$

where M_T represents the value of the magnetic element at the station at the time T, and t is the time interval (in years) between T and a standard epoch, A, B and C being the constants which are to be determined from the observed values of the element at the station. Accordingly B and C mean the rate of change of the magnetic element at the selected epoch and half the annual acceleration of the secular change respectively. After obtaining the values of B and C for each station, their geographical distribution over the region were represented by quadratic functions of longitude and latitude, reduced by the method of least squares. In this report, the formulae are called the distribution formulae of B and C respectively.

The reductions of the old results to the common epoch (1933.0) were executed by using the values of B and C for the observing stations computed from the distribution formulae.

There are two methods of preparation of magnetic chart. One is the graphical method to draw the isolines by free hand to conform to the values of magnetic element which are plotted on a large base map, estimating their best position by only personal judgment. The other is the analytical method; that is, the method to draw the lines by the empirical formula which is deduced by the method of least squares from the observed values of the element and their geographical positions.

The graphical method is most preferable when the available data are numerous and distributed uniformly over the whole area for which the chart should be constructed. Its merits are to be found especially when the area is extraordinarily disturbed; thus, it is easy to locate the local anomalies and to make the differences between observed values and chart values disappear entirely. On the contrary, this method is not facile when the available data preponderate in particular regions and are rare in others as in the present circumstances. Thus, it is unexpectedly difficult to determine the best position of isolines by estimation with such materials and the analytical method is rather preferred. The merits of analytical method consist in the fact that the analytical expression representing a regular distribution of the values of the magnetic element is known and the positions of the isolines may be determined by the formula without any troubles. For this reason, the analytical method has been adopted by the Department in the construction of the isomagnetic charts. However, we can not persist in that, unless the method of determination has physical basis, the location of the isolines determined by the analytical method is more accurate than those determined by the graphical one.

If the distribution of the values of the magnetic element over large area is expressed by a single formula, the analytical method may demand many labori-

ous processes to determine many terms of the empirical formula. However, it is not so if, on the contrary, the area is divided into many districts and handled by a simple formula with small number of data for each district separately.

In the present case, therefore, the two methods are combined. The whole area is divided into many districts. For each district an empirical formula is deduced from the observed data in the district by the method of least squares. Then the preliminary isolines of each district are drawn by the formula and these are connected with the corresponding isolines in the adjacent districts, correcting the lines by free-hand method to conform to the observed values of the element plotted on the map.

The formula assumed for the analytical expression of the geographical distribution of the magnetic element is a quadratic function of latitude and longitude. The formula is called the distribution formula of the magnetic element here.

Available Data.

The data utilized for the preparation of the magnetic charts are as follows:—

Results of Past Magnetic Surveys Carried Out in Japan.—We have had four complete magnetic surveys in Japan to date at intervals of about 10 years; that is, 1887, 1893—6, 1912—3 and 1922—3. The first two of them were conducted by the Imperial University, Tokyo, under supervision of Professor A. Tanakadate, and their results are given in the "Journal of the College of Science, Imperial University, Tokyo, Vol. II and XIV" respectively. The latter two surveys were made by the Hydrographic Department and the results are published in the "Bulletin of the Hydrographic Department Vol. II and V".

The results of this magnetic survey (1932—3) and those of the auxiliary magnetic observations in Manchoukuo made by the Department, which are the most

importan materials for construction of the present magnetic charts, are shown in Table 28 of this volume.

The materials in the northern part of Karahuto surveyed in 1919—20 are utilized here, reducing them to 1933.0, and shown in Table 39.

Annual Mean Values of Magnetic Elements at Magnetic Observatories in Japan and Its Neighbourhood.— The annual means at the Kakioka magnetic Observatory, those at the four meteorological observatories, namely, Ôtomari, Taihoku, Parao (each declination only) and Zinsen (three elements), where magnetic observations have been made four times at intervals of about four hours in the daytime on a fixed day of every week at the request of the Department, and those at foreign magnetic observatories situated in the neighbourhood of Japan are shown in Table 37.

However, the records at the Kakioka Observatory during the period from 1917 to 1923 are not available since they were destroyed by the catastrophe in September 1923.

Results of Magnetic Observations Made by Foreign Organizations Off the Coast of Japan and in Adjacent Countries.— The available data of the Ocean Magnetic Observations made by the Carnegie Institution of Washington are shown in Table 38, of which the data in 1929 are preliminary results published in the "Terrestrial Magnetism and Atmospheric Electricity".

The data in Siberia are obtained from the "Catalogue of Magnetic Determinations in U. S. S. R. and adjacent countries", as shown in Table 40.

Other Data.— Besides the above, we have the results of magnetic observations in China, Manchoukuo and Pacific Islands by the Carnegie Institution or Chinese Government. But these data fairly old (about 20 years ago) and on account of uncertainty of secular changes except in the Chinese coast, the values deduced from these materials are not much reliable in general. They are omitted from this volume, serving only as reference in the construction of the magnetic charts.

Secular Change Data.

It has been the intention of the Hydrographic Department for magnetic survey to investigate the geographical distributions of the magnetic elements in Japan for preparation of the magnetic charts and, at the same time, to determine the secular changes of the elements by means of repeated observations at intervals of about 10 years at many selected stations in all parts of the country. For a long period, however, it was sometimes difficult to repeat observation for some original stations established by the Department owing to the growth of towns or other sources of artificial local disturbance. In such cases we tried to obtain as many secular change data as possible by selecting new stations in the neighbourhood of old sites. But, it seems te be of little value for determination of the average secular changes whether latter observations should be made on the very same spot as the former. For, if the magnetic field at that station is so disturbed as is necessary to make observation every time at the same place, the value of secular change, derived from the data obtained at the station, will be abnormal, though the observations may have been repeated at the same spot. If the field is undisturbed there is no call for an observation at just the same spot.

The results of observations at repeated stations except the stations not occupied by this magnetic survey are given in Table 41. In the column of "Remark" in that table, the letter A indicates that the old stations was reoccupied exactly, B that a new station was established within 0.5 kilometer of the old one, and C that the new station was at a distance greater than 0.5 kilometer from the old one.

Next, it is possible to know the average conditions of the secular change in the sea regions, by the results of the Ocean Magnetic Observations made by the Carnegie Institution of Washington. However, as there is no repeated station, some mathematical treatments are necessary to derive the value of secular change in these regions.

The mean of three or more observed values of a magnetic element (the corresponding dates and positions are also averaged respectively) on a track is taken for each of the tracks of the "Galilee" and "Carnegie", in the vicinity of the intersections of various tracks, and this is taken as the value of the magnetic element at the mean date at the mean position. Such mean values of the magnetic element are reduced to the values at a position selected near the center of these mean positions by means of the variation of the element with latitude and longitude, which has been calculated from the preliminary distribution formula of the element. In this manner the observed results are combined to form a single series of values representing approximately the average conditions of the secular change at the position. These results are shown in Table 42.

General Characters of the Secular Changes of the Magnetic Elements in Japan.

In our country the period of time covered by the magnetic observations is too short to determine the accurate characters of the secular changes of the magnetic elements. As for declination, however, we have the old records of magnetic determinations at Ôgiura in Ogasawara Guntô made by the British Navy in 1827 (declination only)[1] and by the Imperial University, Tokyo, in 1884 (declination and horizontal intensity)[2], and those at Tokyo made by the Central Meteorological Office in 1860 (three elements)[3], by the Naval Observatory in 1872 and 1885—7[4], and by Tadataka Inô in 1802 (declination only)[5] which is inferred from the discussion of his Land Survey of Japan. From these data the general changes of declination in the above districts during about one hundred years past are known. The declination in Ogasawara Guntô is as follows:—

1. British Chart, May 7, 1883.
2. Appendix to the Memoir No. 5 of Tokyo University.
3.,4. Journal of the College of Science, Tokyo University, Vol. II; Annual Reports of the Naval Observatory.
5. "Tadataka Inô, the Japanese Land-surveyor" by R. Ôtani.

The Declination in Ogasawara Guntô.

Date	1827.4	1884.6	1913.4	1922.5	1933.1
Declination	° ′ −1 08	° ′ 2 03.1	° ′ 2 25.7	° ′ 2 42.8	° ′ 2 47.1

Westerly declination is reckoned positive.

In the above table the values of 1827 and 1884 are the results of observations at Ôgiura, and those of 1913, 1922 and 1933 are the ones deduced from the observed values obtained at several stations in Ogasawara Guntô in each date; reference can be made to the "Hydrographic Bulletin, 14th. Year No. 5, 1935, pages 168—169". According to this, though the time-intervals between the determination are fairly large, it is known that the change of the declination in this district shows a very regular form.

With the accumulation of more accurate and systematic data at observatories, it became evident that the secular change of magnetic elements at a station can be expressed with sufficient accuracy by a simple formula for a fairly long period.

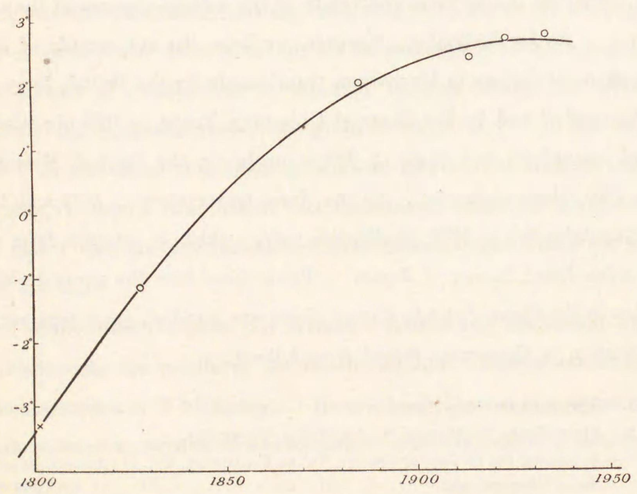


Fig. 7.—Observed and Smoothed Values of Declination at Ôgiura in Ogasawara Guntô.

Hence, in the present case the following empirical formula is computed with the above data, assuming that the declination in this district can be expressed by a quadratic function of time,

$$\delta_t = 2°.376 + 0°.02207\,(t - 1900.0) - 0°.0003588\,(t - 1900.0)^2,$$

where δ_t represents the value of the declination at the time t expressed in years and 1900.0 is the initial epoch, westerly declination being reckoned positive. The probable error of a computed value is 4′.4.

For a more detailed discussion, however, the observed values show a little discrepancies from this empirical formula, but it is negligible in the degree of accuracy which we demand at present. Observed and smoothed values are as in Figure 7.

According to this empirical formula the greatest west declination in this district amounted to 2°.7 in 1931 and it seems to decrease with a small annual change at present. On the other hand, it follows that the value in 1802 was 3°.3 E. and this value is smaller by 6° than the present one. Hence, if we assume that the difference of declination between Ogasawara Guntô and Tokyo district in that period was the same as that in the present day, it also follows that the declination in Tokyo district in those days was 0°.3 E. It is just the same as the value inferred from the result of the land survey made by Tadataka Inô.

Though the formula derived in such a manner is purely empirical, it is supposed, from the above various relations, that the empirical formula represents the relation between time and declination in this district with the accuracy to the extent that we are concerned now.

For the investigation of secular change in larger area of our country, on the other hand, there is no way but to rely on the results of repeated observations made by the Department and the Imperial University of Tokyo during about half a century past. However, from those results it will be recognized that the conditions of the secular changes of declination at most stations in Japan are almost identical with that in Ogasawara Guntô at least during these 30 years.

For dip and horizontal intensity, however, the history of observations is short, and the accurate tendencies of the secular changes in our country can not been obtained. But, what is sure is that the recent annual changes of the both elements are very small in general.

Geographical Distribution of Secular Changes of the Magnetic Elements in Japan.

The annual changes of the magnetic elements in Japan and its neighbourhood, expressed as above, are very small at the present time. Hence the errors in data arising from local magnetic disturbances or displacement of the station from the original site have noticeable influence upon the sign of the present annual change derived. Here, the whole extent surveyed is divided into sixteen regions and the values of each magnetic element at all the repeated stations in a region are combined to form a single series of values representing approximately the average conditions of secular change for that region (Table 43).

From these results, it is known that, for the expression of the value of a magnetic element, a quadratic function of time is preferable as the case of declination in Ogasawara Guntô described before. Hence, we derive an empirical formula of the element for each region, from the data in Table 43, assuming that the magnetic element in that region can be expressed by an equation of the form

$$M_t = A + B(t - 1933.0) + C(t - 1933.0)^2,$$

where M_t represents the value of a magnetic element at any place at the year t and 1933.0 is the initial epoch, A, B and C being constants. The values of the constants for each region will be found in Table 44. For a region, however, where the stations were occupied more than three times, the values of the constants are determined by the method of least squares; and for a region where the observations at the stations were limited to only twice, an approximate annual

change is calculated assuming that the variation was directly proportional to the time-interval.

On the other hand, with the annual mean values at Ôtomari, Zinsen, Taihoku, Parao, Kakioka and other foreign magnetic observatories, the empirical formula of the same form as the above is also deduced by the method of least squares for each station. The values of the constants of the empirical formula are shown in Table 45.

The coefficient B in the empirical formula is the rate of secular change at the epoch 1933.0 and C is half the annual acceleration. Viewed from the geographical distribution of the values of B and C for the sixteen regions and the observatories, it becomes clear that the coefficients vary comparatively regularly with few exceptions, and their distribution can be expressed by a quadratic function of latitude and longitude.

The derived distribution formula of B

for declination is

1. $B_\delta = -0.29 + 0.0397\Delta\varphi + 0.0073\Delta\lambda + 0.00144\Delta\varphi^2 + 0.00044\Delta\varphi\Delta\lambda + 0.00106\Delta\lambda^2$,
$P = \pm 0.17$;

for dip is

2. $B_\theta = 0.66 + 0.0490\Delta\varphi + 0.0031\Delta\lambda - 0.00546\Delta\varphi^2 - 0.00034\Delta\varphi\Delta\lambda - 0.00197\Delta\lambda^2$,
$P = \pm 0.31$;

for horizontal intensity is

3. $B_H = 7.79 - 0.177\Delta\varphi - 0.578\Delta\lambda - 0.0153\Delta\varphi^2 - 0.0059\Delta\varphi\Delta\lambda + 0.0016\Delta\lambda^2$
$P = \pm 2.0$.

In the above formulæ, B_δ, B_θ, and B_H are the values of B for declination, for dip and for horizontal intensity respectively at 1933.0 at any station (latitude φ, longitude λ), while $\Delta\varphi = \varphi - 25°$ and $\Delta\lambda = \lambda - 145°$ expressed in degrees, north

latitude and east longitude being reckoned positive. The letter P under each equation indicates the probable error of a calculated value of B.

However, in the computation of these formulae the data in the following regions and places are excluded: Tisima Rettô, Mariana Syotô, Lukiapang and Tsingtau for declination; Karahuto, Nansei Syotô, Taiwan and Antipolo for dip; Tisima Rettô for horizontal intensity. For, the distribution of the values of B in these quarters are irregular for the element and it is not suitable to represent such distribution by a single quadratic formula.

The treatment explained above is the most useful and time-saving method for the lands of Japan where there are many repeated stations distributed uniformly over the whole area. However, in the reduction of the old observed values on the sea to the common epoch 1933.0, the effective ranges of the empirical formulæ must be extended to the sea region, by introducing the data on the sea into the deduction of the formulæ. While, the data on the sea are very few and less accurate than those on land in general. Therefore, the above method can not be directly applied to this case. For, if we derive the empirical formulæ in the above manner by employing the data on the sea with those in Tables 44 and 45 as the same weight, the resulting formula is much affected by the data on the sea, owing to the minority of observation-equations for the least squares. Of course, in these cases, each of the available data should be given a corresponding different weight in deriving the empirical formula. However, from various points of views, it is very difficult in practice to give an accurate weight to the individual data.

For the present case a different method is used. The empirical formula representing the relation between the value of the magnetic element and time is derived separately for each of the stations where there are more than three repeated suitable observations. The values of the constants A, B and C of the empirical formulæ are shown in Table 46. Similarly, the empirical formulæ of the magnetic elements at the positions in the sea regions shown in Table 42 are

deduced. The values of the constants of the formulæ are shown in Table 47.

The following formulæ representing the geographical distributions (distribution formulæ) of B and C are derived from those data (Tables 46 and 47) with the addition of the data deduced from the annual means at the observatories (Table 45), by the method of least squares giving equal weight to each datum.

4. $B\delta = -0'.41 + 0'.0314\Delta\varphi - 0'.0198\Delta\lambda + 0'.00158\Delta\varphi^2 - 0'.00206\Delta\varphi\Delta\lambda + 0'.00006\Delta\lambda^2$

$P = \pm 0'.38$

5. $C\delta = -0'.063 - 0'.0003\Delta\varphi + 0'.0004\Delta\lambda - 0'.000037\Delta\varphi^2 - 0'.000171\Delta\varphi\Delta\lambda + 0'.00033\Delta\lambda^2$

$P = \pm 0'.025$

6. $B\theta = 0'.955 - 0'.00965\Delta\varphi + 0'.00416\Delta\lambda - 0'.00162\Delta\varphi^2 + 0'.001262\Delta\varphi\Delta\lambda + 0'.00033\Delta\lambda^2$

$P = \pm 0'.54$

7. $C\theta = 0'.152 - 0'.0127\Delta\varphi + 0'.0007\Delta\lambda + 0'.00088\Delta\varphi^2 + 0'.000027\Delta\varphi\Delta\lambda - 0'.000079\Delta\lambda^2$

$P = \pm 0'.029$

8. $BH = 13^{\gamma}.18 - 0^{\gamma}.6591\Delta\varphi - 0^{\gamma}.0997\Delta\lambda + 0^{\gamma}.00649\Delta\varphi^2 - 0^{\gamma}.01214\Delta\varphi\Delta\lambda + 0^{\gamma}.00873\Delta\lambda^2$

$P = \pm 4^{\gamma}.0$

9. $CH = 0^{\gamma}.226 - 0^{\gamma}.014616\Delta\varphi + 0^{\gamma}.003205\Delta\lambda + 0^{\gamma}.000357\Delta\varphi^2 - 0^{\gamma}.0011513\Delta\varphi\Delta\lambda - 0^{\gamma}.0006379\Delta\lambda^2$

$P = \pm 0^{\gamma}.20$

In the above formulæ, $C\delta$, $C\theta$ and CH represent half the annual accelerations C of the secular changes of declination, dip and horizontal intensity at any station respectively and all the other notations are the same as those in the foregoing formulæ. In the deduction of Formulæ 6—9, the materials in Nanyô Guntô

(South Sea Islands) and Tisima Rettô are not used, for in those regions the observations were only twice for dip and horizontal intensity.

Comparing the corresponding formulæ among those obtained in these two ways, it is known that they are almost the same in Japan Proper where there are many data, but the discrepancies become especially noticeable as we depart from it. These discrepancies are principally ascribed to the fact that, in deriving them, the data on the sea were added to the available data only in latter case.

Reduction to the Epoch 1933.0.

For the reduction to the epoch 1933.0 of the results obtained by the Department in 1932 and 1933, it is preferred to use Formulæ 1, 2 and 3. However, the reduction is neglected for these results. For, as this survey was completed in a short interval of eighteen months and nearly the middle (1933) of this survey was selected as the standard epoch, the time-interval between the epoch and time of observation at any station is very short (within ten months). Farther, the annual change of each magnetic element is very small in our country at present. The reduction is negligible in its result compared with error arising from other sources.

For the results of observations in the northern part of Karahuto (1919—20) and those in the Pacific Ocean except the results in 1929, the time-interval between the time of each observation and the epoch is comparatively large, and hence they must be corrected for secular change. In these cases most of the observed values of the elements are reduced to the common epoch by Formulæ (4, 5), (6, 7) and (8, 9).

The observed value in the vicinity of Philippine Islands is reduced to the epoch with the amount of change of the element interpolated from the changes of observed values during the elapsed time at the Buitenzorg and Antipolo Observatories, according to the variation in value with latitude. For the formulæ (4—9) can not be used in these extreme regions. For the same reason, the observed values of dip in the northern part of Karahuto are reduced by the mean annual change in the southern part of it.

To inspect the accuracy of the values reduced in these ways, the following methods were applied:

(a). Comparison between the both reduced values whose position of observations are close each other and times of observation are different.

(b). Comparison of the value reduced from the result of old observation in the vicinity of an island with that obtained by the present survey in the island.

By these comparisons it is verified that the reduced values of declinations are correct with sufficient accuracy in general, but those of dip and horizontal intensity are not correct in the extreme regions of the charted area. It is clear that this discrepancy has its root in the distribution formulæ of B and C for these elements which should not be extended to the extreme region for lack of the available materials. In the preparation of the present magnetic charts described later, therefore, the observed values of declination in the whole area are all utilized, reducing them to theepoch 1933.0. But in the cases of dip and horizontal intensity, only the results of the recent determinations are utilized in the extreme regions of the area, the others being merely used for reference.

The data in Siberia are reduced to the same epoch by using the secular change table mentioned in the "Catalogue of Magnetic Determinations in U. S. S. R. and Adjacent Countries" published by the Central Geophysical Observatory, Leningrad.

Vertical Variations of Magnetic Elements.

The vertical variations of magnetic elements have been calculated by the method of Prof. Tanakadate. That is to say, if there are no magnetic matters and electric current of appreciable effect, in the space where observations were carried out, so

$$\mathrm{div}\,\mathrm{F}=0, \qquad \mathrm{rot}\,\mathrm{F}=0.$$

These give in polar co-ordinates,

$$\frac{\partial \mathrm{X}}{\partial \mathrm{r}} = -\frac{1}{\mathrm{r}}\left(\frac{\partial \mathrm{Z}}{\partial \varphi}+\mathrm{X}\right),$$

$$\frac{\partial \mathrm{Y}}{\partial \mathrm{r}} = \frac{1}{\mathrm{r}}\left(\frac{1}{\cos\varphi}\cdot\frac{\partial \mathrm{Z}}{\partial \lambda}-\mathrm{Y}\right),$$

$$\frac{\partial \mathrm{Z}}{\partial \mathrm{r}} = \frac{1}{\mathrm{r}}\left(\frac{\partial \mathrm{X}}{\partial \varphi}-\frac{1}{\cos\varphi}\cdot\frac{\partial \mathrm{Y}}{\partial \lambda}-X\tan\varphi-2\mathrm{Z}\right),$$

where r is the distance from the center of the earth and φ and λ are latitude and longitude of the point on the earth measured towards up, north and east correspondingly, while X, Y and Z are the components of the earth magnetic force reckoned positive towards north, west and down respectively.

By the relations, $\delta=\tan^{-1}\frac{\mathrm{Y}}{\mathrm{X}}$, $\theta=\tan^{-1}\frac{\mathrm{Z}}{\mathrm{H}}$ and $\mathrm{H}=\sqrt{\mathrm{X}^2+\mathrm{Y}^2}$,

we have

$$\frac{\partial \delta}{\partial \mathrm{r}} = \frac{1}{\mathrm{H}}\left(\cos\delta\,\frac{\delta \mathrm{Y}}{\partial \mathrm{r}}-\sin\delta\,\frac{\partial \mathrm{X}}{\partial \mathrm{r}}\right),$$

$$\frac{\partial \theta}{\partial \mathrm{r}} = \frac{\cos^2\theta}{\mathrm{H}}\left(\frac{\partial \mathrm{Z}}{\partial \mathrm{r}}-\tan\theta\,\frac{\partial \mathrm{H}}{\partial \mathrm{r}}\right),$$

$$\frac{\partial \mathrm{H}}{\partial \mathrm{r}} = \cos\delta\,\frac{\partial \mathrm{X}}{\partial \mathrm{r}}+\sin\delta\,\frac{\partial \mathrm{Y}}{\partial \mathrm{r}}.$$

On the other hand, if the earth is uniformly magnetized sphere,

$$\mathrm{H}=\mathrm{M}\sin\Theta\,\frac{1}{\mathrm{r}^3}, \quad \mathrm{Z}=2\,\mathrm{M}\cos\Theta\,\frac{1}{\mathrm{r}^3},$$

$$\frac{\partial \mathrm{H}}{\partial \mathrm{r}}=-3\mathrm{H}\frac{1}{\mathrm{r}}, \quad \frac{\partial \mathrm{Z}}{\partial \mathrm{r}}=-3\mathrm{Z}\frac{1}{\mathrm{r}}, \quad \frac{\partial \mathrm{X}}{\partial \mathrm{r}}=-3\mathrm{X}\frac{1}{\mathrm{r}}, \quad \frac{\partial \mathrm{Y}}{\partial \mathrm{r}}=-3\mathrm{Y}\frac{1}{\mathrm{r}},$$

wher M is the magnetic monent of the earth and Θ the magnetic pole distance of the point. For the point on the earth surface r is the radius R of the earth.

The vertical variation of each element is calculated in these two ways at 17 stations, using Formula 10, 19, 24 and 30—32 which are given in the latter paragraph. The results are shown in Table 48. Among the values of the vertical variation of each element in the table, the values shown in the upper line are calculated by the former method and those in the lower line by the latter one.

Reduction to Sea Level.

The heights of the stations occupied by this survey are so small in general, namely, 0.57 kilometre at the most. Therefore, the reduction of the values of observed elements to the sea level is neglected. The effect of the reduction is within the error arising from other sources.

Empirical Formulæ for Regular Distributions of the Elements.

The distribution of the values of each element in the area included in the present chart, especially in the northern parts of it, is fairly complicated. If the single formula is applied to express the distribution of the element over the whole area, the formula may need numerous terms. It is very laborious and time-consuming work to derive such a distribution formula. Furthermore, even if such a formula may be derived, it can never be said that the formula is more convenient, in drawing the isolines, than several simpler formulæ each of which represents the distribution of a magnetic element in a particular district.

In the present case, the whole area are divided into so many districts that a quadratic formula may be sufficient to represent the geographical distribution of the element in a district. The partitions of the area, however, are different more or less according to the kind of elements as in Fig. 8—10. The assumed empirical expression is the form

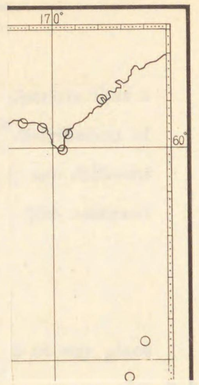
$$M_{1933.0} = a + b\,\Delta\varphi + c\,\Delta\lambda + d\,\Delta\varphi^2 + e\,\Delta\varphi\Delta\lambda + f\,\Delta\lambda^2 ,$$

where $M_{1933.0}$ represents the value of the element at the year 1933.0 at any place (latitude φ, longitude λ); $\Delta\varphi = \varphi - 25°$ and $\Delta\lambda = \lambda - 145°$ expressed in degrees, north latitude and east longitude being reckoned positive; a, b, c, d, e and f are constants which remain to be determined from given values of $M_{1933.0}$, $\Delta\varphi$ and $\Delta\lambda$.

The observed elements being reduced to the epoch 1933.0 as described in the last paragraph (for the observatory the annual mean nearest to the epoch are adopted), the values of $\Delta\varphi$, $\Delta\lambda$, $\Delta\varphi^2$, $\Delta\varphi\Delta\lambda$ and $\Delta\lambda^2$ in the observation-equations for the least squares solution were calculated for each of the stations.

In deducing the distribution formula, the usual method of least squares is applied to the data in a district and its surrounding places, giving equal weight to each datum. However, a few isolated anomalous stations are excluded from the calculation. Certain stations whose positions are close each other as those in a small island are averaged and used as a single station, but the others are not averaged for fear of smoothing out the regional anomalies.

The deduced distribution formulæ are shown later. The letters N and P under each formula indicate the number of stations utilized and the probable error of a calculated value respectively, and the Roman numeral after the formula represents district number to which the formula should be applied.



Distribution Formulæ of Declination. — The formula representing a regular distribution for the whole area is

10. $\delta_{1933.0} = 92.'25 + 15.'934\Delta\varphi - 8.'923\Delta\lambda + 0.'373\Delta\varphi^2 - 0.'1684\Delta\varphi\Delta\lambda - 0.'3657\Delta\lambda^2$,

$N = 219$, $P = \pm 24.'2$,

where $\delta_{1933.0}$ is the value of declination at the year 1933.0 at any place, and $\Delta\varphi = \varphi - 25°$ and $\Delta\lambda = \lambda - 145°$ expressed in degrees.

Next, the whole area is divided into six districts (see Fig. 8) and the following formulæ are derived for them: —

11. $\delta_{1933.0} = 81.'24 + 17.'93\Delta\varphi - 14.'31\Delta\lambda + 0.'0191\Delta\varphi^2 - 0.'0705\Delta\varphi\Delta\lambda - 0.'6604\Delta\lambda^2$ I

$N = 106$ $P = \pm 9.'4$

12. $\delta_{1933.0} = 82.'52 + 19.'861\Delta\varphi - 7.'223\Delta\lambda + 0.'2579\Delta\varphi^2 + 0.'0879\Delta\varphi\Delta\lambda - 0.'2426\Delta\lambda^2$ II

$N = 61$ $P = \pm 7.'6$

13. $\delta_{1933.0} = 206.'5 + 26.'66\Delta\varphi - 27.'87\Delta\lambda + 0.'382\Delta\varphi^2 - 0.'575\Delta\varphi\Delta\lambda + 0.'149\Delta\lambda^2$ III

$N = 34$ $P = \pm 9.'2$

14. $\delta_{1933.0} = 75.'47 + 17.'656\Delta\varphi - 12.'640\Delta\lambda + 0.'0433\Delta\varphi^2 - 0.'2896\Delta\varphi\Delta\lambda - 0.'2961\Delta\lambda^2$ IV

$N = 112$ $P = \pm 12.'9$

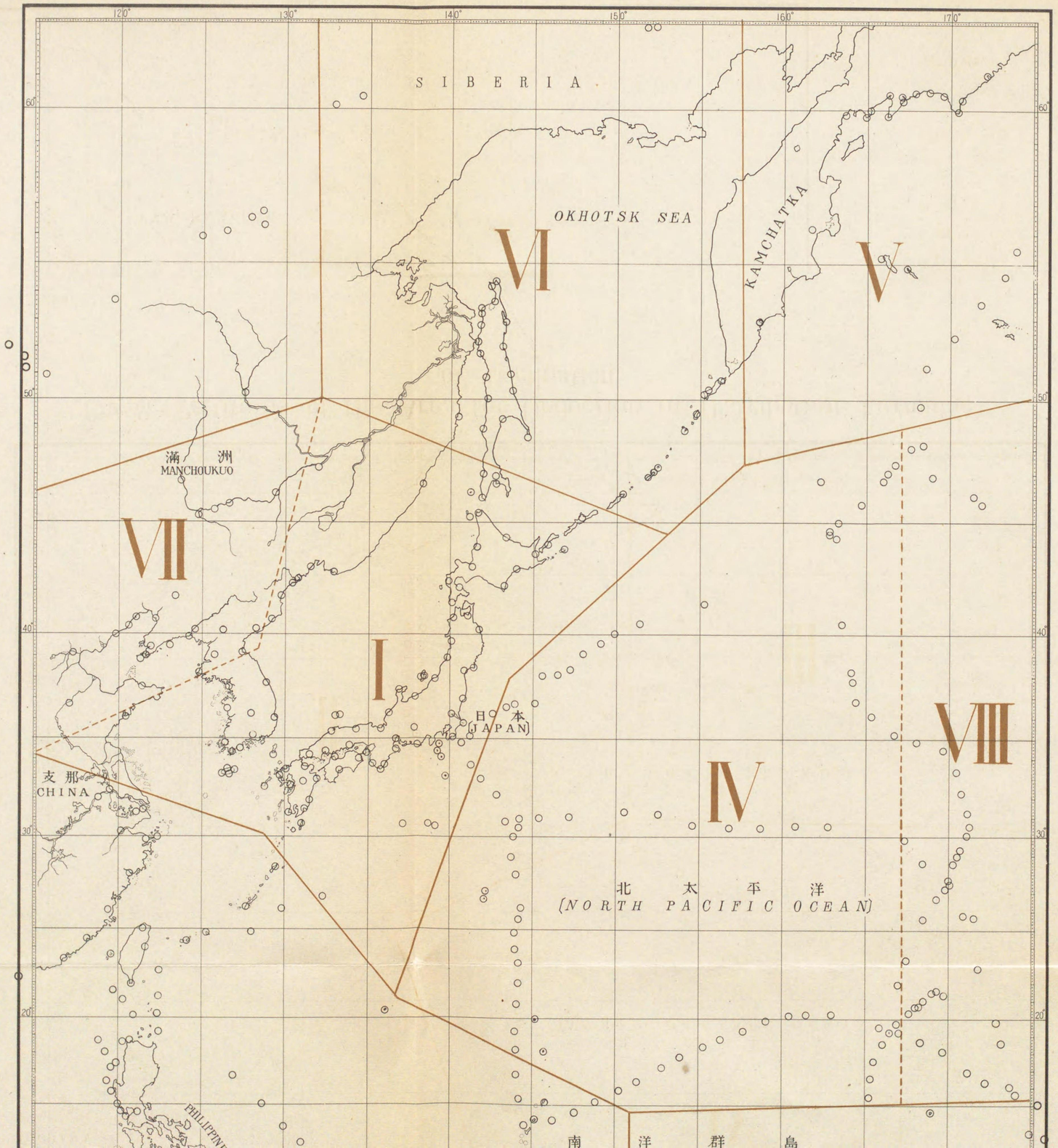
15. $\delta_{1933.0} = -899.'6 + 89.'24\Delta\varphi - 7.'15\Delta\lambda - 1.'129\Delta\varphi^2 - 0.'760\Delta\varphi\Delta\lambda - 0.'149\Delta\lambda^2$ V

$N = 26$ $P = \pm 13.'2$

16. $\delta_{1933.0} = 469.'7 - 10.'112\Delta\varphi + 3.'328\Delta\lambda + 0.'450\Delta\varphi^2 - 1.'175\Delta\varphi\Delta\lambda + 0.'462\Delta\lambda^2$ VI

$N = 41$ $P = \pm 20.'7$

As the supplements, the following formulæ are derived for Districts VII and VIII overlapping certain others: —



Distribution Formulæ of Declination.

lar distribution for the whole area is

10. $\delta_{1933.0} = 92.'25 + 15.'934\Delta\varphi - 8.'923\Delta\lambda + 0.'3$

N=219,

where $\delta_{1933.0}$ is the value of declination at
$\Delta\varphi = \varphi - 25°$ and $\Delta\lambda = \lambda - 145°$ expressed

Next, the whole area is divided into six di
formulæ are derived for them:—

11. $\delta_{1933.0} = 81.'24 + 17.'93\Delta\varphi - 14.'31\Delta\lambda + 0.'01$

N=106

12. $\delta_{1933.0} = 82.'52 + 19.'861\Delta\varphi - 7.'223\Delta\lambda + 0.'2$

N=61

13. $\delta_{1933.0} = 206.'5 + 26.'66\Delta\varphi - 27.'87\Delta\lambda + 0.'38$

N=34

14. $\delta_{1933.0} = 75.'47 + 17.'656\Delta\varphi - 12.'640\Delta\lambda + 0.'$

N=112

15. $\delta_{1933.0} = -899.'6 + 89.'24\Delta\varphi - 7.'15\Delta\lambda - 1.'1$

N=26

16. $\delta_{1933.0} = 469.'7 - 10.'112\Delta\varphi + 3.'328\Delta\lambda + 0.'45$

N=41

As the supplements, the following formula
VIII overlapping certain others:—

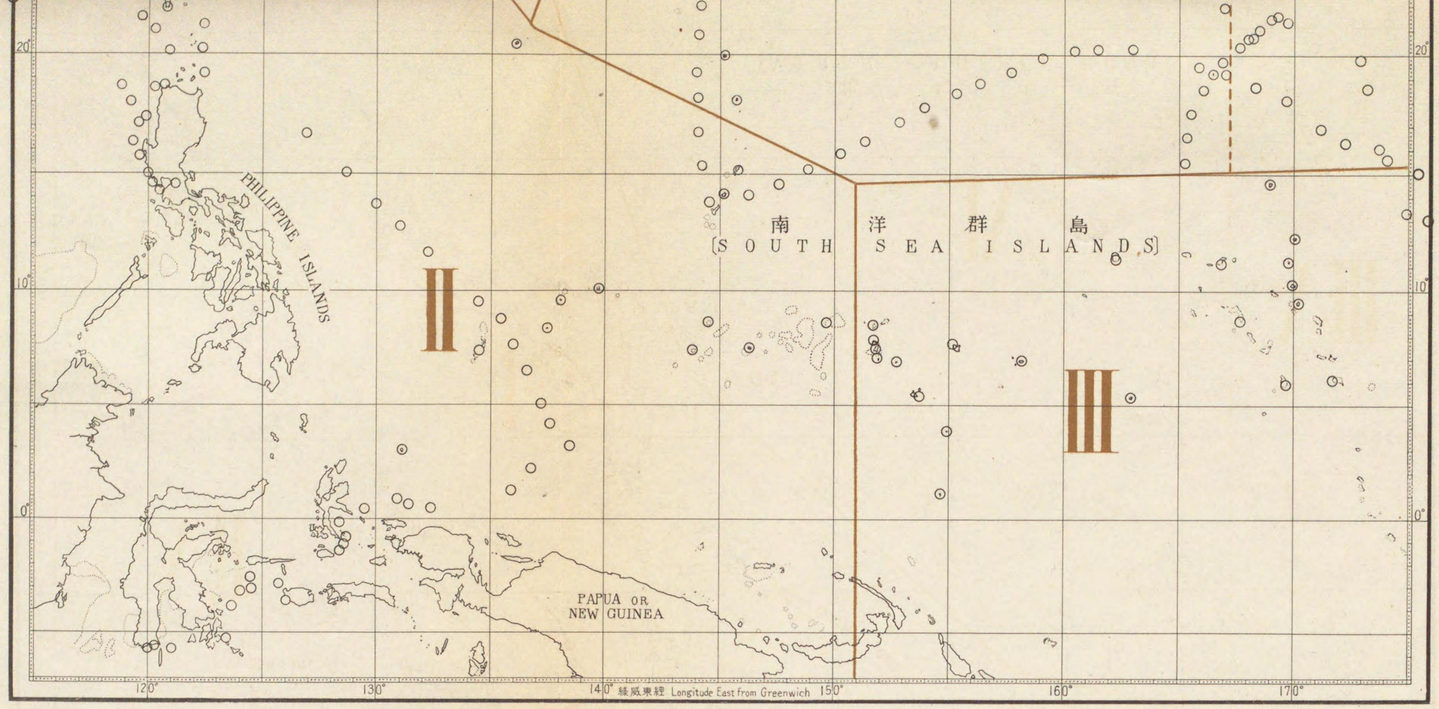


Fig. 8.- Partitions of the Area for Deduction of Distribution Formulae of Declination.

17. $\delta_{1933.0} = 24'.38 + 24'.56\Delta\varphi - 19'.49\Delta\lambda - 0'.1698\Delta\varphi^2 + 0'.2271\Delta\varphi\Delta\lambda - 0'.7292\Delta\lambda^2$ VII

N = 120 P = ±12'.5

18. $\delta_{1933.0} = 166'.4 + 18'.95\Delta\varphi - 26'.49\Delta\lambda + 0'.087\Delta\varphi^2 - 0'.395\Delta\varphi\Delta\lambda + 0'.148\Delta\lambda^2$ VIII

N = 30 P = ±6'.1

Distribution Formulæ of Dip.— The Formula representing a regular distribution for the whole area is

19. $\theta_{1933.0} = 33^\circ\ 56'.1 + 92'.332\Delta\varphi + 0'.776\Delta\lambda - 0'.9360\Delta\varphi^2 - 0'.4222\Delta\varphi\Delta\lambda + 0'.18382\Delta\lambda^2$

N = 178 P = ±19'.5

where $\theta_{1933.0}$ is the value of dip at the year 1933.0 at any place, and $\Delta\varphi = \varphi - 25^\circ$ and $\Delta\lambda = \lambda - 145^\circ$ expressed in degrees.

Next, the whole area is divided into four districts (see Fig. 9) and the following formulæ are computed for them:—

20. $\theta_{1933.0} = 34^\circ\ 4'.9 + 88'.61\Delta\varphi - 3'.08\Delta\lambda - 0'.768\Delta\varphi^2 - 0'.2356\Delta\varphi\Delta\lambda + 0'.1330\Delta\lambda^2$ I

N = 122 P = ±8'.6

21. $\theta_{1933.0} = 33^\circ\ 58'.8 + 92'.56\Delta\varphi - 3'.965\Delta\lambda - 0'.973\Delta\varphi^2 - 0'.3890\Delta\varphi\Delta\lambda - 0'.0347\Delta\lambda^2$ II

N = 37 P = ±5'.1

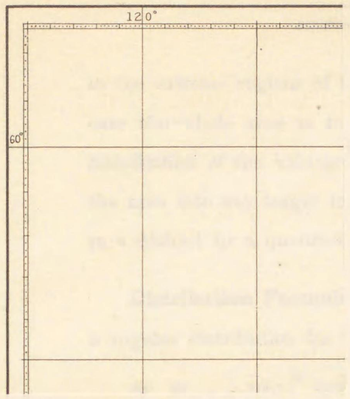
22. $\theta_{1933.0} = 33^\circ\ 56'.2 + 96'.78\Delta\varphi - 3'.230\Delta\lambda - 0'.6838\Delta\varphi^2 - 0'.4394\Delta\varphi\Delta\lambda + 0'.3561\Delta\lambda^2$ III

N = 35 P = ±1'.9

23. $\theta_{1933.0} = 36^\circ\ 4' + 73'.88\Delta\varphi - 9'.82\Delta\lambda - 0'.3452\Delta\varphi^2 + 0'.00662\Delta\varphi\Delta\lambda + 0'.2145\Delta\lambda^2$ IV

N = 56 P = ±18'

As for dip, the area can not be divided into so many districts as in the case of declination. For the distribution formulæ of B and C for dip is not accurate



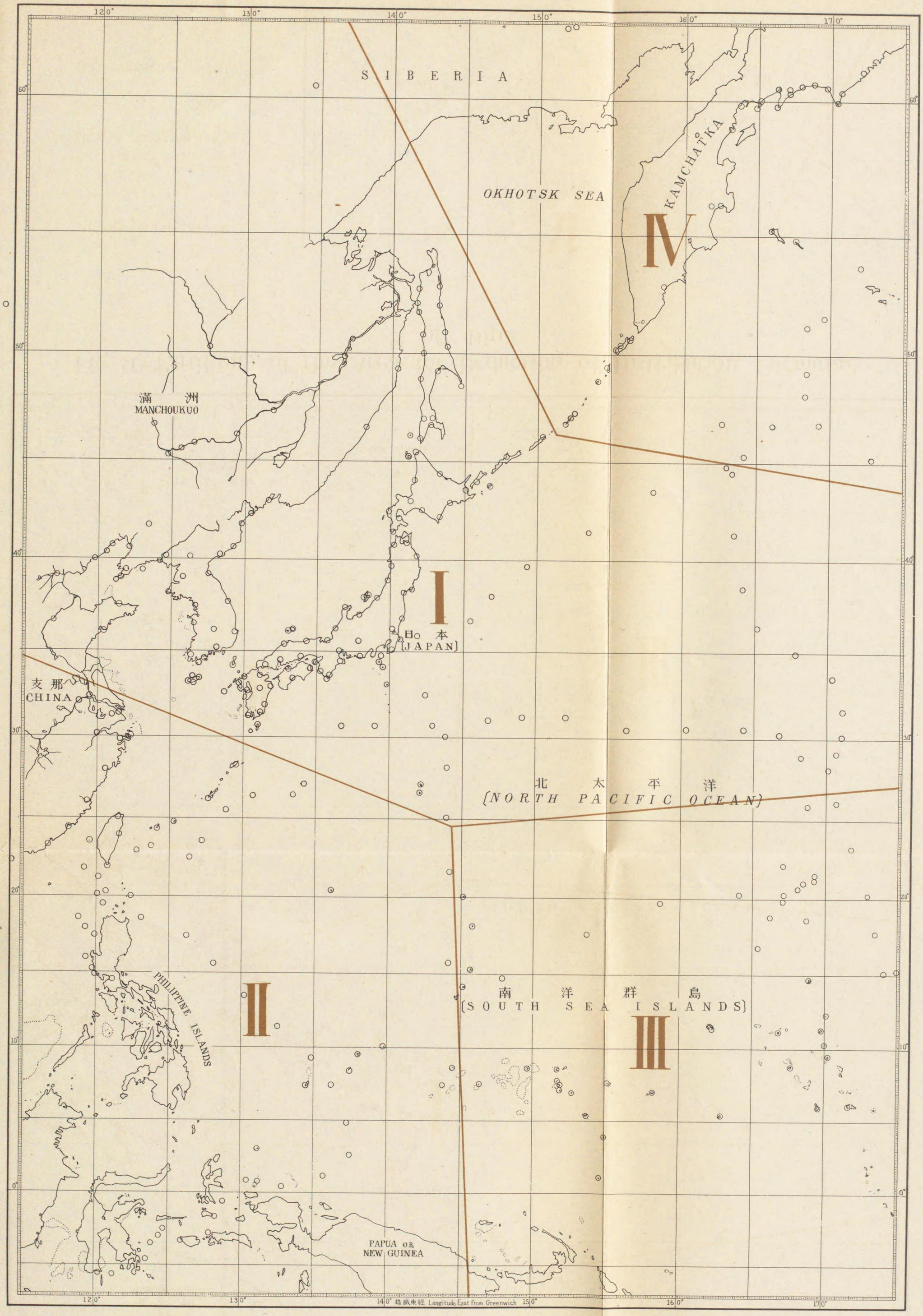


Fig. 9.–Partitions of the Area for Deduction of Distribution Formulae of Dip.

in the extreme regions of the area and we can not use so many data distributing over the whole area as in the case of declination. On the other hand, the distribution of the values of dip is not so complicated as it is necessary to divide the area into any larger number of districts to represent the distribution of dip in a district by a quadratic formula.

Distribution Formulæ of Horizontal Intensity.—The formula representing a regular distribution for the whole area is

24. $H_{1933.0}=32916^{\gamma}-268.25^{\gamma}\Delta\varphi-96.39^{\gamma}\Delta\lambda-4.185^{\gamma}\Delta\varphi^2+2.647^{\gamma}\Delta\varphi\Delta\lambda+0.178^{\gamma}\Delta\lambda^2$

$N=157$ $\quad P=\pm 266^{\gamma}$

where $H_{1933.0}$ is the value of horizontal intensity at the year 1933.0 at any place, and $\Delta\varphi=\varphi-25°$ and $\Delta\lambda=\lambda-145°$ expressed in degrees.

For the same reason as in the case of dip, the area is not to be divided into so many districts as in the case of declination. Here, the area is divided into five districts (see Fig. 10) and an empirical formula is derived for each of them:—

25. $H_{1933.0}=32147^{\gamma}-173.70^{\gamma}\Delta\varphi-190.74^{\gamma}\Delta\lambda-6.755^{\gamma}\Delta\varphi^2+7.921^{\gamma}\Delta\varphi\Delta\lambda-1.656^{\gamma}\Delta\lambda^2$ I

$N=118$ $\quad P=\pm 86^{\gamma}$

26. $H_{1933.0}=31496^{\gamma}-204.4^{\gamma}\Delta\varphi-261.1^{\gamma}\Delta\lambda-8.18^{\gamma}\Delta\varphi^2+5.18^{\gamma}\Delta\varphi\Delta\lambda-3.26^{\gamma}\Delta\lambda^2$ II

$N=24$ $\quad P=\pm 88^{\gamma}$

27. $H_{1933.0}=32497^{\gamma}-266.2^{\gamma}\Delta\varphi-135.1^{\gamma}\Delta\lambda-4.05^{\gamma}\Delta\varphi^2+0.38^{\gamma}\Delta\varphi\Delta\lambda+0.31^{\gamma}\Delta\lambda^2$ III

$N=54$ $\quad P=\pm 134^{\gamma}$

28. $H_{1933.0}=32254^{\gamma}-195.7^{\gamma}\Delta\varphi-137.8^{\gamma}\Delta\lambda-5.76^{\gamma}\Delta\varphi^2+4.79^{\gamma}\Delta\varphi\Delta\lambda-0.55^{\gamma}\Delta\lambda^2$ IV

$N=51$ $\quad P=\pm 100^{\gamma}$

29. $H_{1933.0}=32606^{\gamma}-198.2^{\gamma}\Delta\varphi-193.5^{\gamma}\Delta\lambda+0.37^{\gamma}\Delta\varphi^2-1.08^{\gamma}\Delta\varphi\Delta\lambda+2.71^{\gamma}\Delta\lambda^2$ V

$N=53$ $\quad P=\pm 167^{\gamma}$

Distribution Formulæ of X, Y and Z.——As for the north component X, west component Y and downward component Z of the earth's magnetism, the following formulæ are derived. However, these are the provisional formulæ used in computing the vertical variations of the magnetic elements.

30. $X_{1933.0} = 32942^{\gamma} - 266.50^{\gamma}\Delta\varphi - 89.90^{\gamma}\Delta\lambda - 4.752^{\gamma}\Delta\varphi^2 + 3.396^{\gamma}\Delta\varphi\Delta\lambda + 0.555^{\gamma}\Delta\lambda^2$

N=149 P=±251$^{\gamma}$

31. $Y_{1933.0} = 1167^{\gamma} + 141.61^{\gamma}\Delta\varphi - 75.65^{\gamma}\Delta\lambda - 1.619^{\gamma}\Delta\varphi^2 - 0.757^{\gamma}\Delta\varphi\Delta\lambda - 3.173^{\gamma}\Delta\lambda^2$

N=149 P=±160$^{\gamma}$

32. $Z_{1933.0} = -22325^{\gamma} - 1109.90^{\gamma}\Delta\varphi + 91.76^{\gamma}\Delta\lambda + 5.356^{\gamma}\Delta\varphi^2 + 10.142^{\gamma}\Delta\varphi\Delta\lambda - 1.794^{\gamma}\Delta\lambda^2$

N=149 P=±219$^{\gamma}$

MAGNETIC CHARTS FOR THE EPOCH 1933.0.

In the construction of the isomagnetic chart, the preliminary isolines in each district were drawn directly through the points determined from the distribution formulæ shown in the last paragraph. For determining the point on a isoline, the value of the isoline and either one of latitude and longitude of the point were given to the distribution formula and the remainder was computed. The preliminary isolines in each district drawn in this way were somewhat modified to conform to the observed values (in the strict sense, the observed values reduced to the epoch 1933.0) plotted on the map more closely. The modification of the isoline was carefully done so as not to curve them covering too broad area

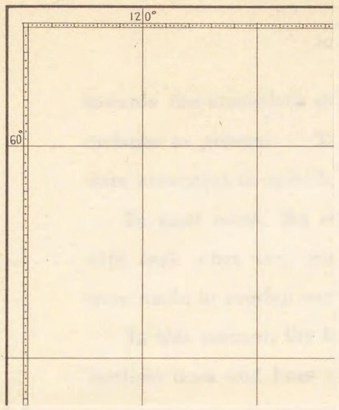


Fig. 10.-Partitions of the Area for Deduction of Distribution Formulae of Horizontal Intensity.

towards the anomalous station, for the effect of anomalies is limited to a short distance in general. Then the corresponding isolines in the adjacent districts were connected in smooth curves.

In most cases, the corresponding isolines in neighbouring districts coincide with each other very closely in their junctions, as the margins of the districts were made to overlap each other in the division of the whole area.

In this manner, the isogonic lines are drawn spacing half a degree, and the isoclinic lines and lines of equal horizontal intensity are represented at intervals of five degrees and 500 gammas respectively (see Pl. II, III and IV).

The observed values of declination, as also of dip, which differ from the corresponding chart values by more than 1° are shown in red at their corresponding geographic positions on the charts. In the case of horizontal intensity, the observed values differing by more than 1,000 gammas are similarly shown.

The differences between the observed and calculated values are shown in Table 49. However, the differences between the observed and chart values are smaller than the above differences, for the isolines of the magnetic charts are somewhat modified to suit to the observed values, especially in the north ends of the charts.

Of all parts of the magnetic chart, that of the Okhotsk Sea and its vicinity is placed under the most unfavourable condition; that is, this part is highly disturbed and moreover the data are very few (in the Okhotsk Sea there is no data). For these reasons, the isolines of each element in this part may be less accurate than those of all other parts of the magnetic chart.

Lines of Equal Annual Change for 1933.

For the use of the magnetic charts in years subsequent to 1933, the rate of change B of the magnetic element at the year 1933.0 is shown on each magnetic chart by means of lines of equal value of the rate. The lines are drawn, in

the same manner as in the case of the isolines of the magnetic element, by the distribution formulæ of B, and are corrected so as to conform to the values of B determined by the repeated observation at the stations. Those lines are designated as the Lines of Equal Annual Change for 1933, as the effect of the annual acceleration is negligible for a short interval of time.

MAPS.

The geographical distribution of all magnetic stations utilized for the construction of the magnetic charts are shown on Pl. I, where red circles indicate the situations of the magnetic stations occupied by this decennial magnetic survey and the auxiliary magnetic observations of the Department whose results are published in this volume. The stations marked with the red circles upper half of which painted in red are those established during 1919—20 in the northern part of Karahuto. The stations in the vicinity of Seizan Tô in the south coast of Tyôsen, however, are represented by a red cross circumscribed by red circle including all the stations except Kwan Tô in Table 30. The station indicated by sepia circle is declination station and that by sepia cross dip and horizontal intensity station of the Carnegie; red spot the Government of U. S. S. R.; sepia spot the Chinese Government; a double red circle is an observatory.

The Pl. II, III and IV show the charts of declination, dip and horizontal intensity and their annual changes for the epoch 1933.0 respectively.

TABLES FOR THE CONSTRUCTION OF THE MAGNETIC CHARTS

FOR 1933.0

Table 37.—ANNUAL MEANS OF THE MAGNETIC ELEMENTS AT OBSERVATORIES.

Sitka, Alaska

Lat. = 57° 03′ N, Long. = 224° 40′ W.

Date	Three Elements of Terrestrial Magnetism			Date	Three Elements of Terrestrial Magnetism		
	Declination	Dip	Horizontal Intensity		Declination	Dip	Horizontal Intensity
	° ′	° ′	γ		° ′	° ′	γ
1902.5	−29 51.1	74 47.8	15456	1919.5	−30 26.7	74 23.2	15578
3.5	−29 53.9	74 46.3	15472	1920.5	−30 28.2	74 22.1	15574
4.5	−29 55.8	74 45.4	15490	21.5	−30 28.5	74 22.6	15570
5.5	−29 59.1	74 43.2	15510	22.5	−30 29.1	74 22.4	15560
6.5	−30 03.2	74 41.0	15529	23.5	−30 28.9	74 22.1	15549
7.5	−30 07.1	74 38.4	15545	24.5	−30 28.6	74 21.9	15540
8.5	−30 10.7	74 36.5	15562	25.5	−30 27.2	74 22.2	15524
9.5	−30 13.1	74 34.6	15576	26.5	−30 25.2	74 22.9	15501
1910.5	−30 16.4	74 32.2	15593	27.5	−30 23.5	74 22.6	15491
11.5	−30 19.1	74 30.4	15606	28.5	−30 21.2	74 22.8	15476
12.5	−30 20.9	74 28.8	15615	29.5	−30 17.7	74 22.7	15465
13.5	−30 22.0	74 27.7	15606	1930.5	−30 15.6	74 22.8	15448
14.5	−30 22.9	74 26.6	15605	31.5	−30 13.1	74 23.5	15454
15.5	−30 23.2	74 26.5	15593				
16.5	−30 23.9	74 25.6	15585				
17.5	−30 24.7	74 24.8	15584				
18.5	−30 24.9	74 23.8	15580				

Ôtomari, Karahuto

Lat. = 46° 38′ N, Long. = 142° 46′ E.

1920.5	8 11.3	.....	.....	1928.5	8 32.6	.....	.....
21.5	8 15.4	.....	.....	29.5	8 35.0	.....	.....
22.5	8 18.7	.....	.....	1930.5	8 35.5	.....	.....
23.5	8 20.6	.....	.....	31.5	8 36.2	.....	.....
24.5	8 23.5	.....	.....	32.5	8 38.5	.....	.....
25.5	8 25.9	.....	.....	33.5	8 40.8	.....	.....
26.5	8 29.1	.....	.....			.....	.....
27.5	8 30.8	.....	.....			.....	.....

Zinsen, Tyôsen

Lat. = 37° 30′ N, Long. = 126° 28′ E.

1918.5	5 41.1	53 16.	29978	1929.5	6 02.4	53 16.1	29923
1921.5	5 26.5	53 19.9	.....	1930.5	6 03.8	53 07.9	29831
22.5	5 31.3	53 13.8	.....	31.5	6 03.9	53 11.7	29866
26.5	5 57.8	53 09.0	30001	32.5	6 04.1	53 12.3	29975
27.5	5 59.3	53 07.7	29971	33.5	6 03.7	53 13.0	30027
28.5	6 00.8	53 12.8	29965				

Table 37.—ANNUAL MEANS OF THE MAGNETIC ELEMENTS AT OBSERVATORIES—Continued.

Kakioka, Honsyû

Lat. = 36° 14′ N, Long. = 140° 11′ E.

Date	Three Elements of Terrestrial Magnetism			Date	Three Elements of Terrestrial Magnetism		
	Declination	Dip	Horizontal Intensity		Declination	Dip	Horizontal Intensity
	° ′	° ′	γ		° ′	° ′	γ
1913.5	5 10.1	49 30.9	29749	1928.5	5 40.5	49 27.0	29707
14.5	5 12.9	49 29.8	29783	29.5	5 41.9	49 26.1	29704
15.5	5 15.6	49 31.3	29752	1930.5	5 42.4	49 27.9	29713
16.5	5 17.6	49 31.7	29743	31.5	5 42.8	49 27.6	29734
1924.5	5 31.6	49 29.5	29708	32.5	5 44.3	49 28.6	29722
25.5	5 34.4	49 27.9	29716	33.5	5 45.5	49 28.8	29723
26.5	5 36.6	49 27.8	29694	34.5	5 47.2	49 29.5	29720
27.5	5 39.6	49 27.6	29702				

Tsingtau, China

Lat. = 36° 04′ N, Long. = 120° 19′ E.

1904.5	3 40.2	... .	.....	1920.5	4 12.9	52 07.0	30817
6.5	3 40.2	... .	.....	24.5	4 21.3	52 07.0	30816
7.5	3 41.7	... .	.....	25.5	4 22.6	52 05.9	30831
8.5	3 43.6	52 21.5	30766	26.5	4 27.0	52 11.9	30823
9.5	3 44.5	... .	.....	27.5	4 29.8	52 07.7	30824
1910.5	3 49.5	... .	.....	28.5	4 30.7	52 08.9	30833
11.5	3 53.1	... .	.....	29.5	4 33.0	52 06.6	30870
12.5	3 54.5	52 07.3	30888	1930.5	4 32.8	52 06.8	30868
16.5	4 04.7	52 07.1	30842	31.5	4 32.1	52 05.1	30880
17.5	4 07.0	52 06.1	30851	32.5	4 32.6	52 05.2	30920
18.5	4 08.2	52 06.9	30827	33.5	4 33.0	52 05.1	30930
19.5	4 09.9	52 07.4	30812	34.5	4 33.7	52 05.1	30943

Tucson, U. S. A.

Lat. = 32° 15′ N, Long. = 110° 50′ W.

1910.5	−13 25.8	59 19.6	27379	1923.5	−13 47.3	59 28.8	26794
11.5	−13 29.7	59 19.9	27370	24.5	−13 46.4	59 29.4	26745
12.5	−13 33.5	59 20.3	27331	25.5	−13 45.3	59 30.6	26687
13.5	−13 37.0	59 21.8	27247	26.5	−13 44.6	59 32.3	26632
14.5	−13 39.9	59 23.1	27188	27.5	−13 44.1	59 32.5	26585
15.5	−13 42.5	59 24.7	27119	28.5	−13 44.7	59 33.5	26536
16.5	−13 44.4	59 26.1	27063	29.5	−13 45.7	59 34.7	26491
17.5	−13 46.1	59 26.4	27021	1930.5	−13 47.7	59 37.0	26432
18.5	−13 47.1	59 26.5	26982	31.5	−13 49.5	59 37.5	26399
19.5	−13 47.8	59 27.0	26940				
1920.5	−13 48.0	59 27.6	26910				
21.5	−13 47.7	59 28.0	26875				
22.5	−13 47.5	59 29.0	26839				

Table 37.—ANNUAL MEANS OF THE MAGNETIC ELEMENTS AT OBSERVATORIES—Continued.

Lukiapang, China

Lat. = 31° 19′ N, Long. = 121° 02′ E.

Date	Three Elements of Terrestrial Magnetism			Date	Three Elements of Terrestrial Magnetism		
	Declination	Dip	Horizontal Intensity		Declination	Dip	Horizontal Intensity
	° ′	° ′	γ		° ′	° ′	γ
1908.5	2 57.3	45 35.1	33196	1922.5	3 25.1	45 30.5	33204
9.5	2 58.6	45 34.9	33207	23.5	3 25.9	45 29.3	33205
1910.5	3 01.1	45 34.4	33217	24.5	3 28.5	45 29.0	33200
11.5	3 02.5	45 33.9	33225	25.5	3 30.5	45 27.8	33160
12.5	3 04.6	45 32.9	33228	26.5	3 32.6	45 27.9	33211
13.5	3 07.2	45 32.6	33233	27.5	3 34.8	45 26.9	33265
14.5	3 09.5	45 31.7	33227	28.5	3 37.4	45 25.4	33243
15.5	3 13.2	45 32.1	33212	29.5	3 37.2	45 24.9	33278
16.5	3 16.0	45 31.9	33201	1930.5	3 37.4	45 25.1	33264
17.5	3 17.8	45 31.5	33201	31.5	3 37.0	45 22.5	33313
18.5	3 18.8	45 31.0	33212				
19.5	3 20.0	45 31.0	33187				
1920.5	3 21.4	45 30.7	33175				
21.5	3 24.0	45 30.5	33189				

Taihoku, Taiwan

Lat. = 25° 02′ N, Long. = 121° 31′ E.

1919.5	1 56.4	.....	.....	1927.5	2 07.6	.....	.....
1920.5	1 57.5	.....	.....	28.5	2 08.6	.....	.....
21.5	1 58.8	.....	.....	29.5	2 08.6	.....	.....
22.5	2 00.2	.....	.....	1930.5	2 09.2	.....	.....
23.5	2 01.7	.....	.....	31.5	2 09.6	.....	.....
24.5	2 03.2	.....	.....	32.5	2 09.6	.....	.....
25.5	2 04.9	.....	.....	33.5	2 09.9	.....	.....
26.5	2 06.4	.....	.....	34.5	2 09.7	.....	.....

Hongkong, China

Lat. = 22° 18′ N, Long. = 114° 10′ E.

1884.5	−0 47.0	32 26.6	36026	1895.5	−0 27.8	31 46.9	36479
85.5	−0 45.2	32 26.4	36021	96.5	−0 26.1	31 41.5	36462
86.5	−0 43.0	32 25.5	36063	97.5	−0 23.4	31 37.0	36546
87.5	−0 42.1	32 22.4	36125	98.5	−0 22.6	31 33.4	36604
88.5	−0 41.0	32 21.0	36131	99.5	−0 21.0	31 29.4	36676
89.5	−0 38.5	32 16.9	36190	1900.5	−0 18.5	31 24.7	36728
1890.5	−0 37.3	32 08.6	36233	1.5	−0 16.4	31 20.8	36783
91.5	−0 35.5	32 05.4	36255	2.5	−0 15.1	31 16.3	36834
92.5	−0 33.5	32 02.5	36352	3.5	−0 13.5	31 11.6	36830
93.5	−0 31.1	31 56.7	36434	4.5	−0 10.5	31 09.8	36953
94.5	−0 29.2	31 53.3	36448	5.5	−0 08.9	31 06.6	36975

Table 37.—ANNUAL MEANS OF THE MAGNETIC ELEMENTS AT OBSERVATORIES—Continued.

Hongkong, China

Lat. = 22° 18′ N, Long. = 114° 10′ E.

Date	Three Elements of Terrestrial Magnetism			Date	Three Elements of Terrestrial Magnetism		
	Declination	Dip	Horizontal Intensity		Declination	Dip	Horizontal Intensity
	° ′	° ′	γ		° ′	° ′	γ
1906.5	−0 07.0	31 05.8	37037	1921.5	0 22.8	30 45.0	37190
7.5	−0 05.9	31 03.0	37009	22.5	0 24.5	30 45.2	37174
8.5	−0 03.9	31 02.4	37047	23.5	0 26.2	30 43.9	37190
9.5	−0 02.1	31 00.4	37091	24.5	0 26.8	30 42.0	37189
1910.5	−0 00.4	30 58.8	37108	25.5	0 30.3	30 41.0	37220
11.5	0 02.4	30 58.5	37145	26.5	0 32.6	30 41.6	37218
12.5	0 04.5	30 56.3	37206	27.5	0 34.7	30 39.1	37271
13.5	0 06.5	30 53.7	37166	28.5	0 33.3	30 36.3	37219
14.5	0 08.8	30 53.5	37184	29.5	0 33.7	30 36.2	37322
15.5	0 11.7	30 52.2	37166	1930.5	0 33.8	30 34.8	37326
16.5	0 13.8	30 51.8	37144	31.5	0 33.5	30 31.9	37363
17.5	0 16.3	30 50.4	37155				
18.5	0 17.9	30 48.3	37151				
19.5	0 19.8	30 47.5	37158				
1920.5	0 20.7	30 46.4	37174				

Honolulu, Hawaiian Is.

Lat. = 21° 19′ N, Long. = 201° 56′ E.

1902.5	−9 19.1	40 14.5	29284	1919.5	− 9 50.8	39 25.8	28871
3.5	−9 19.8	40 12.3	29257	1920.5	− 9 53.2	39 25.1	28847
4.5	−9 20.9	40 09.4	29237	21.5	− 9 55.3	39 24.5	28824
5.5	−9 21.7	40 05.8	29226	22.5	− 9 57.1	39 24.5	28794
6.5	−9 23.0	40 02.0	29220	23.5	− 9 58.9	39 23.9	28772
7.5	−9 24.3	39 59.1	29201	24.5	−10 00.3	39 24.2	28750
8.5	−9 25.7	39 55.3	29188	25.5	−10 01.8	39 25.9	28708
9.5	−9 27.3	39 51.4	29167	26.5	−10 03.0	39 28.3	28658
1910.5	−9 29.7	39 47.2	29161	27.5	−10 04.2	39 28.9	28634
11.5	−9 32.2	39 42.2	29139	28.5	−10 04.7	39 30.1	28601
12.5	−9 34.8	39 38.4	29214	29.5	−10 04.7	39 30.2	28569
13.5	−9 37.3	39 32.6	29075	1930.5	−10 04.3	39 29.2	28542
14.5	−9 39.6	39 30.4	29045	31.5	−10 04.4	39 24.4	28551
15.5	−9 41.6	39 29.1	29005				
16.5	−9 43.9	39 29.5	28966				
17.5	−9 46.3	39 27.2	28935				
18.5	−9 48.6	39 26.7	28905				

Table 37.—ANNUAL MEANS OF THE MAGNETIC ELEMENTS AT OBSERVATORIES—Continued.

Teoloyucan, Mexico

Lat. = 19° 45′ N, Long. = 99° 11′ W.

Date	Three Elements of Terrestrial Magnetism			Date	Three Elements of Terrestrial Magnetism			
	Declination	Dip	Horizontal Intensity		Declination	Dip	Horizontal Intensity	
	° ′	° ′	γ		° ′	° ′	γ	
1919.5	−9 04.6	.....	.....	1927.5	−9 19.7	46 41.3	31373	
1920.5	−9 06.7	.....	.....	28.5	−9 22.0	46 44.1	31325	
21.5	−9 10.0	.....	.....	29.5	−9 23.5	46 47.6	31301	
22.5	−9 09.9	46 30.7	32160	1930.5	−9 25.4	46 54.1	31202	
23.5	−9 14.0	46 24.5	31538	1931.5	−9 27.2	46 57.7	31162	
24.5	−9 14.4	46 28.5	31551					
25.5	−9 14.6	46 30.4	31600					
26.5	−9 17.8	46 46.7	31609					

Antipolo, Philippine Is.

Lat. = 14° 36′ N, Long. = 121° 10′ E.

1910.5	−0 39.8	16 17.2	38244	1923.5	−0 31.7	16 00.0	38174
11.5	−0 41.3	16 18.6	38072	24.5	−0 31.5	15 59.7	38201
12.5	−0 40.0	16 15.1	38101	25.5	−0 29.8	15 57.4	38211
13.5	−0 39.4	16 14.7	38090	26.5	−0 28.5	15 54.3	38189
14.5	−0 38.8	16 10.6	38062	27.5	−0 27.7	15 54.5	38205
15.5	−0 37.3	16 11.2	38095	28.5	−0 26.9	15 50.4	38228
16.5	−0 37.3	16 09.8	38096	29.5	−0 26.5	15 47.9	38231
17.5	−0 35.9	16 07.7	38088	1930.5	−0 26.7	15 47.2	38244
18.5	−0 35.5	16 05.0	38115	31.5	−0 27.3	15 48.2	38270
19.5	−0 36.1	15 54.2	38107				
1920.5	−0 35.9	16 11.7	38100				
21.5	−0 34.2	16 07.8	38116				
22.5	−0 32.3	16 06.0	38116				

Parao, Nisi-Karorin Syotô (Palau, West Caroline Is.)

Lat. = 7° 20′ N, Long. = 139° 29′ E.

1926.	−2 00.5	.....	.....	1931.5	−2 02.2	.....	.....
27.5	−2 00.2	.....	.....	32.5	−2 03.6	.....	.....
28.5	−1 59.9	.....	.....				
29.5	−1 59.8	.....	.....				
1930.5	−2 00.6	.....	.....				

Table 37.—ANNUAL MEANS OF THE MAGNETIC ELEMENTS AT OBSERVATORIES—Continued.

Buitenzorg, Java

Lat. = 6° 35′ S, Long. = 106° 47′ E.

Date	Three Elements of Terrestrial Magnetism			Date	Three Elements of Terrestrial Magnetism		
	Declination	Dip	Horizontal Intensity		Declination	Dip	Horizontal Intensity
	° ′	° ′	γ		° ′	° ′	γ
1902.5	−1 02.4	−30 17.6	36717	1919.5	−0 46.0	−31 50.2	36728
3.5	−0 59.7	−30 23.7	36696	1920.5	−0 47.0	−31 53.7	36796
4.5	−0 57.5	−30 33.2	36697	21.5	−0 47.9	−31 56.7	36766
5.5	−0 55.0	−30 39.7	36690	22.5	−0 49.3	−32 00.3	36784
6.5	−0 54.1	−30 48.5	36708	23.5	−0 52.2	−32 00.9	36805
7.5	−0 52.2	−30 55.2	36710	24.5	−0 52.9	−32 04.3	36821
8.5	−0 50.7	−31 02.4	36694	25.5	−0 53.1	−32 07.6	36834
9.5	−0 49.5	−31 09.2	36682	26.5	−0 51.7	−32 11.5	36832
1910.5	−0 48.7	−31 12.0	36660	27.5	−0 52.4	−32 12.8	36858
11.5	−0 47.7	−31 16.4	36664	28.5	−0 53.4	−32 15.0	36832
12.5	−0 47.3	−31 19.4	36683	29.5	−0 54.0	−32 16.6	36815
13.5	−0 46.4	−31 24.4	36690	30.5	−0 55.	−32 18.	36820
14.5	−0 46.2	−31 28.8	36686	31.5	−0 57.8	−32 19.8	36862
15.5	−0 46.1	−31 33.6	36676				
16.5	−0 46.0	−31 38.4	36698				
17.5	−0 45.9	−31 42.0	36724				
18.5	−0 46.0	−31 46.2	36716				

Apia, Samoa Is.

Lat. = 13° 48′ S, Long. = 171° 46′ W.

1906.5	− 9 38.5	−29 14.4	35655	1921.5	−10 10.7	−30 03.8	35265
7.5	− 9 40.1	−29 18.9	35637	22.5	−10 13.6	−30 05.6	35241
8.5	− 9 41.9	−29 21.8	35613	23.5	−10 16.2	−30 06.6	35250
9.5	− 9 43.9	.....	35590	24.5	−10 19.2	−30 07.5	35249
1910.5	− 9 45.7	.....	35550	25.5	−10 22.8	−30 0.79	35239
11.5	− 9 47.4	−29 36.1	35527	26.5	−10 26.1	−30 08.3	35216
12.5	− 9 50.3	−29 41.2	35487	27.5	−10 29.5	−30 07.0	35223
13.5	− 9 51.9	−29 45.9	35455	28.5	−10 32.1	−30 05.7	35225
14.5	− 9 53.7	−29 49.5	35429	29.5	−10 33.5	−30 06.7	35209
15.5	− 9 56.8	−29 52.7	35389	1930.5	−10 34.2	−30 07.9	35196
16.5	− 9 59.9	−29 54.5	35364	31.5	−10 35.2	−30 09.3	35171
17.5	−10 02.9	−29 57.8	35339				
18.5	−10 05.9	−29 59.5	35313				
19.5	−10 08.7	−30 01.5	35289				

Table 37.—ANNUAL MEANS OF THE MAGNETIC ELEMENTS AT OBSERVATORIES—Continued.

Watheroo, Australia

Lat. = 30° 19′ S, Long. = 115° 53′ E.

Date	Three Flements of Terrestrial Magnetism			Date	Three Elements of Terrestrial Magnetism		
	Declination	Dip	Horizontal Intensity		Declination	Dip	Horizontal Intensity
	° ′	° ′	γ		° ′	° ′	γ
1919.5	4 24.4	−64 51.6	24929	1928.5	4 15.0	64 13.8	24656
20.5	4 24.4	−64 54.4	24895	29.5	4 12.1	64 15.5	24645
21.5	4 22.6	−64 57.7	24848	1930.5	4 08.0	64 17.7	24633
23.5	4 19.5	−64 03.0	24777				
24.5	4 18.3	−64 05.2	24750				
25.5	4 17.6	−64 07.9	24719				
26.5	4 17.2	−64 10.7	24681				
27.5	4 16.3	−64 11.9	24671				

Toolangi, Australia

Lat. = 37° 32′ S, Long. = 145° 28′ E.

1920.5	−8	00.8	−67	55.1	22874	1929.5	−8 17.5	−67 50.3	22883
23.5	−8	10.7	−67	40.6	22995	1930.5	−8 21.6	−67 52.4	22851
24.5	−8	10.1	−67	42.6	22986	31.5	−8 24.5	−67 51.1	22890
25.5	−8	10.4	−67	44.5	22948				
26.5	−8	10.9	−67	46.9	22917				
27.5	−8	12.1	−67	47.8	22904				
28.5	−8	18.4	−67	49.7	22883				

Christchurch, New Zealand

Lat. = 43° 32′ S, Long. = 172° 37′ E.

1902.5	−16	15.1	−67	40.8	22694	1921.5	−17 04.6	−68 10.3	22241
3.5	−16	18.3	−67	42.3	22669	22.5	−17 08.3	−68 11.2	22217
4.5	−16	21.8	−67	44.1	22644	23.5	−17 11.7	−68 12.0	22209
5.5	−16	25.4	−67	45.8	22628	24.5	−17 16.4	−68 17.7	22188
1910.5	−16	37.6	−67	54.8	22515	25.5	−17 21.1	−68 14.2	22166
11.5	−16	39.0	−67	56.2	22494	26.5	−17 26.0	−68 15.6	22141
13.5	−16	44.0	−67	58.2	22449	27.5	−17 31.6	−68 16.2	22136
14.5	−16	44.8	−67	59.8	22414	28.5	−17 37.4	−68 17.3	22126
15.5	−16	47.0	.....		22387	29.5	−17 42.4	−68 17.6	22123
16.5	−16	49.8	.....		22355	1930.5	−17 48.3	−68 18.3	22108
17.5	−16	53.0	−68	04.8	22328				
18.5	−16	55.7	−68	06.7	22304				
19.5	−16	58.6	−68	07.8	22280				
1920.5	−17	01.7	−68	09.2	22261				

Table 38.—RESULTS OF OCEAN MAGNETIC OBSERVATIONS BY THE CARNEGIE INSTITUTION OF WASHINGTON AND CORRESPONDING VALUES REDUCED TO 1933.0.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1929	° ′	° ′	°	°	°	°	°	°	C.G.S.	C.G.S.	C.G.S.
.35	13 09	177 41	−9.6	0.0	−9.6	.....	.....	.....	.....	.....	.....
.35	13 59	176 47	−9.7	0.0	−9.7	.....	.....	.....	.....	.....	.....
.35	15 05	175 23	−8.9	0.0	−8.9	.....	.....	.....	.....	.....	.....
.35	15 16	175 03	.....	...	.....	23.3	−0.1	23.2	0.312	−0.001	0.311
.35	15 38	174 03	−9.0	0.0	−9.0	.....	.....	.....	.....	.....	.....
.35	16 20	172 17	−8.4	0.0	−8.4	.....	.....	.....	.....	.....	.....
.35	16 56	171 13	−8.3	0.0	−8.3	.....	.....	.....	.....	.....	.....
.36	18 06	169 42	−7.7	0.0	−7.7	.....	.....	.....	.....	.....	.....
.36	18 34	168 44	.....	...	.....	26.0	0.0	26.0	0.309	−0.001	0.308
.36	18 41	168 23	−7.1	0.0	−7.1	.....	.....	.....	.....	.....	.....
.36	19 13	167 01	−6.8	0.0	−6.8	.....	.....	.....	.....	.....	.....
.36	20 16	164 03	.....	...	.....	27.6	0.0	27.6	0.304	0.000	0.304
.36	20 16	163 04	−5.0	0.0	−5.0	.....	.....	.....	.....	.....	.....
.36	20 13	161 33	−4.6	0.0	−4.6	.....	.....	.....	.....	.....	.....
.36	20 13	160 30	−4.7	0.0	−4.7	.....	.....	.....	.....	.....	.....
.37	19 52	159 04	−4.1	0.0	−4.1	.....	.....	.....	.....	.....	.....
.37	19 42	158 47	.....	...	.....	25.7	0.0	25.7	0.318	0.000	0.318
.37	19 14	157 45	−3.7	0.0	−3.7	.....	.....	.....	.....	.....	.....
.37	18 44	156 24	−3.3	0.0	−3.3	.....	.....	.....	.....	.....	.....
.37	18 21	155 21	−3.1	0.0	−3.1	.....	.....	.....	.....	.....	.....
.37	17 45	153 58	−2.8	0.0	−2.8	.....	.....	.....	.....	.....	.....
.37	17 35	153 39	.....	...	.....	21.6	0.0	21.6	0.329	0.000	0.329
.37	17 09	152 50	−2.7	0.0	−2.7	.....	.....	.....	.....	.....	.....
.38	16 20	151 18	−2.5	0.0	−2.5	.....	.....	.....	.....	.....	.....
.38	15 49	150 13	−2.3	0.0	−2.3	.....	.....	.....	.....	.....	.....
.38	15 11	148 51	−2.1	0.0	−2.1	.....	.....	.....	.....	.....	.....
.38	14 46	147 59	.....	...	.....	16.4	0.0	16.4	0.343	0.000	0.343
.38	14 36	147 37	−2.0	0.0	−2.0	.....	.....	.....	.....	.....	.....
.38	14 08	146 17	−2.0	0.0	−2.0	.....	.....	.....	.....	.....	.....
.40	13 49	144 32	−1.7	0.0	−1.7	.....	.....	.....	.....	.....	.....
.40	15 22	144 12	−1.1	0.0	−1.1	.....	.....	.....	.....	.....	.....
.40	15 43	144 09	.....	...	.....	17.9	0.0	17.9	0.347	0.000	0.347
.40	16 46	144 05	−1.0	0.0	−1.0	.....	.....	.....	.....	.....	.....
.40	18 12	144 03	−0.5	0.0	−0.5	.....	.....	.....	.....	.....	.....
.40	19 16	144 00	−0.3	0.0	−0.3	.....	.....	.....	.....	.....	.....
.41	20 49	144 07	−0.2	0.0	−0.2	.....	.....	.....	.....	.....	.....
.41	21 44	144 13	.....	...	.....	28.3	0.0	28.3	0.334	0.000	0.334
.41	21 59	144 14	0.7	0.0	0.7	.....	.....	.....	.....	.....	.....
.41	23 07	144 12	1.0	0.0	1.0	.....	.....	.....	.....	.....	.....
.41	23 52	144 00	1.1	0.0	1.1	.....	.....	.....	.....	.....	.....
.41	24 50	144 02	1.6	0.0	1.6	.....	.....	.....	.....	.....	.....

Table 38.—RESULTS OF OCEAN MAGNETIC OBSERVATIONS BY THE CARNEGIE INSTITUTION OF WASHINGTON AND CORRESPONDING VALUES REDUCED TO 1933.0—Continued.

Date	Position				Declination			Dip			Horizontal Intensity		
	Latitude		Longitude		Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
19.29	°	′	°	′	°	°	°	°	°	°	C.G.S.	C.G.S.	C.G.S.
.41	25	04	144	04	.....	...	.....	34.1	0.0	34.1	0.325	0.000	0.325
.41	25	34	144	12	1.2	0.0	1.2	.....	.....	.....	.....	.....	.....
.41	26	12	144	23	1.7	0.0	1.7	.....	.....	.....	.....	.....	.....
.42	27	59	144	04	2.6	0.0	2.6	.....	.....	.....	.....	.....	.....
.42	28	12	144	01	.....	...	.....	38.5	0.0	38.5	0.318	0.000	0.318
.42	28	55	143	52	2.6	0.0	2.6	.....	.....	.....	.....	.....	.....
.42	30	00	143	58	3.3	0.0	3.3	.....	.....	.....	.....	.....	.....
.42	30	05	143	55	.....	...	.....	41.1	0.0	41.1	0.315	0.000	0.315
.42	30	28	144	16	2.9	0.0	2.9	.....	.....	.....	.....	.....	.....
.42	30	52	144	19	3.5	0.0	3.5	.....	.....	.....	.....	.....	.....
.42	32	11	142	53	4.2	0.0	4.2	.....	.....	.....	.....	.....	.....
.42	32	30	142	28	.....	...	.....	44.6	0.0	44.6	0.308	0.000	0.308
.42	32	58	141	55	4.7	0.0	4.7	.....	.....	.....	.....	.....	.....
.43	33	41	141	20	5.0	0.0	5.0	.....	.....	.....	.....	.....	.....
.48	34	47	140	46	5.1	0.0	5.1	.....	.....	.....	.....	.....	.....
.48	35	02	141	16	5.0	0.0	5.0	.....	.....	.....	.....	.....	.....
.48	35	51	141	49	.....	...	.....	48.9	0.0	48.9	0.297	0.000	0.297
.48	36	11	142	33	5.4	0.0	5.4	.....	.....	.....	.....	.....	.....
.49	36	34	143	27	5.2	0.0	5.2	.....	.....	.....	.....	.....	.....
.49	36	39	143	58	5.0	0.0	5.0	.....	.....	.....	.....	.....	.....
.49	36	42	145	08	4.9	0.0	4.9	.....	.....	.....	.....	.....	.....
.49	36	44	145	26	.....	...	.....	49.5	0.0	49.5	0.291	0.000	0.291
.49	38	04	145	34	5.3	0.0	5.3	.....	.....	.....	.....	.....	.....
.50	38	05	146	34	4.8	0.0	4.8	.....	.....	.....	.....	.....	.....
.50	38	06	146	53	.....	...	.....	50.8	0.0	50.8	0.285	0.000	0.285
.50	38	20	147	18	4.8	0.0	4.8	.....	.....	.....	.....	.....	.....
.50	39	05	148	02	5.5	0.0	5.5	.....	.....	.....	.....	.....	.....
.50	39	36	149	09	4.6	0.0	4.6	.....	.....	.....	.....	.....	.....
.50	39	42	149	17	.....	...	.....	52.4	0.0	52.4	0.278	0.000	0.278
.50	40	02	149	56	5.1	0.0	5.1	.....	.....	.....	.....	.....	.....
.50	40	28	151	32	4.5	0.0	4.5	.....	.....	.....	.....	.....	.....
.51	41	27	153	34	.....	...	.....	53.6	0.0	53.6	0.270	0.000	0.270
.51	41	23	155	18	2.7	0.0	2.7	.....	.....	.....	.....	.....	.....
.51	43	32	158	03	.....	...	.....	55.4	0.0	55.4	0.259	−0.001	0.258
.52	46	44	162	20	1.0	0.0	1.0	.....	.....	.....	.....	.....	.....
.52	46	51	162	40	.....	...	.....	58.6	0.0	58.6	0.245	−0.001	0.244
.52	47	03	166	18	−0.9	0.0	−0.9	.....	.....	.....	.....	.....	.....
.52	46	53	169	01	−3.2	0.0	−3.2	.....	.....	.....	.....	.....	.....
.52	46	48	169	13	.....	...	.....	58.4	0.0	58.4	0.245	−0.001	0.244
.53	46	06	171	30	−3.6	0.0	−3.6	.....	.....	.....	.....	.....	.....
.53	45	47	171	59	−3.0	0.0	−3.0	.....	.....	.....	.....	.....	.....

Table 38.—RESULTS OF OCEAN MAGNETIC OBSERVATIONS BY THE CARNEGIE INSTITUTION OF WASHINGTON AND CORRESPONDING VALUES REDUCED TO 1933.0—Continued.

Date	Position				Declination			Dip			Horizontal Intensity		
	Latitude		Longitude		Observed Value	Red. to 1933 0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1929	°	′	°	′	°	′	°	°	°	°	C.G.S.	C.G.S.	C.G.S.
.53	45	11	172	53	.....	...	.....	57.2	0.0	57.2	0.245	0.002	0.243
1915								°	′	°			
.62	55	28	174	01	− 4	50	60	− 3	50	.....	.....	.....	.....	.....	.....
.63	54	35	173	21	− 4	40	57	− 3	43	.....	.....	.....	.....	.....	.....
.63	53	46	172	05	.....		...	.....		64	43	− 7	64	36	0.2169	− 0.0022	0.2147
.63	53	35	171	55	− 3	44	55	− 2	49	.....	.....	.....	.....	.....	.....	.....	.....
.63	52	22	170	18	− 3	20	51	− 2	29	.....	.....	.....	.....	.....	.....	.....	.....
.63	51	35	169	39	.....		...	.....		63	05	− 1	63	04	0.2251	− 0.0018	0.2233
.63	51	14	168	28	.....		...	.....		62	10	+ 2	62	12	0.2314	− 0.0019	0.2295
.63	51	13	168	37	− 2	10	49	− 1	21	.....	.....	.....	.....	.....	.....	.....	.....
.64	49	46	168	16	− 1	58	45	− 1	13	.....	.....	.....	.....	.....	.....	.....	.....
.64	49	12	168	21	.....		...	.....		60	29	0	60	29	0.2370	− 0.0015	0.2355
.64	48	14	168	22	− 1	44	40	− 1	04	.....	.....	.....	.....	.....	.....	.....	.....
.64	48	13	168	17	.....		...	.....		60	22	− 2	60	20	0.2384	− 0.0013	0.2371
.64	48	04	167	43	− 2	08	40	− 1	28	.....	.....	.....	.....	.....	.....	.....	.....
.64	47	27	166	45	− 1	39	40	− 0	59	.....	.....	.....	.....	.....	.....	.....	.....
.64	46	46	166	03	.....		...	.....		58	25	+ 1	58	26	0.2459	− 0.0011	0.2448
.64	46	39	165	52	− 1	13	38	− 0	35	.....	.....	.....	.....	.....	.....	.....	.....
.64	45	48	164	43	− 0	45	35	− 0	10	.....	.....	.....	.....	.....	.....	.....	.....
.64	45	20	164	07	.....		...	.....		57	22	+ 3	57	25	0.2484	− 0.0009	0.2475
.64	45	20	164	00	− 0	44	34	− 0	10	.....	.....	.....	.....	.....	.....	.....	.....
.65	45	00	163	18	− 0	45	35	− 0	10	.....	.....	.....	.....	.....	.....	.....	.....
.65	44	45	162	54	.....		...	.....		57	41	+ 5	57	46	0.2522	− 0.0008	0.2514
.65	44	38	162	48	− 0	21	34	0	13	.....	.....	.....	.....	.....	.....	.....	.....
.65	44	32	162	49	− 0	10	34	0	24	.....	.....	.....	.....	.....	.....	.....	.....
.65	44	29	163	12	.....		...	.....		56	03	+ 4	56	07	0.2564	− 0.0007	0.2557
.65	44	21	163	10	− 0	23	33	0	10	.....	.....	.....	.....	.....	.....	.....	.....
.65	41	19	163	30	.....		...	.....		53	19	− 3	53	16	0.2623	− 0.0005	0.2618
.65	40	33	163	35	− 1	10	23	− 0	47	.....	.....	.....	.....	.....	.....	.....	.....
.66	39	31	163	49	− 1	48	22	− 1	26	.....	.....	.....	.....	.....	.....	.....	.....
.66	38	30	164	09	.....		...	.....		50	32	−11	50	21	0.2685	− 0.0001	0.2684
.66	38	15	164	13	− 2	11	19	− 1	52	.....	.....	.....	.....	.....	.....	.....	.....
.66	37	50	164	16	− 2	05	18	− 1	47	.....	.....	.....	.....	.....	.....	.....	.....
.66	36	51	164	28	− 2	23	15	− 2	08	.....	.....	.....	.....	.....	.....	.....	.....
.66	36	23	165	09	.....		...	.....		48	13	−19	47	54	0.2745	0.0001	0.2746
.66	36	08	165	25	− 3	05	14	− 2	51	.....	.....	.....	.....	.....	.....	.....	.....
.66	35	13	166	42	− 3	57	11	− 3	46	.....	.....	.....	.....	.....	.....	.....	.....
.66	34	55	167	47	.....		...	.....		46	55	−30	46	25	0.2750	0.0002	0.2752
.66	34	54	168	07	− 4	13	9	− 4	04	.....	.....	.....	.....	.....	.....	.....	.....
.66	34	26	169	44	− 5	29	7	− 5	22	.....	.....	.....	.....	.....	.....	.....	.....
.66	33	33	170	19	.....		...	.....		45	48	−41	45	07	0.2741	0.0002	0.2743

Table 38.—RESULTS OF OCEAN MAGNETIC OBSERVATIONS BY THE CARNEGIE INSTITUTION OF WASHINGTON AND CORRESPONDING VALUES REDUCED TO 1933.0—Continued.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1915	° ′	° ′	° ′	′	° ′	° ′	′	° ′	C.G.S.	C.G.S.	C.G.S.
.66	33 24	170 29	− 5 37	+ 6	− 5 31	.....	.....	.....	.....	.....	.....
.67	32 16	170 48	− 6 07	+ 3	− 6 04	.....	.....	.....	.....	.....	.....
.67	31 34	171 04	.....	.....	.....	44 01	−49	43 12	0.2767	0.0004	0.2771
.67	31 13	171 10	− 6 18	+ 1	− 6 17	.....	.....	.....	.....	.....	.....
.67	30 28	171 18	− 6 43	0	− 6 43	.....	.....	.....	.....	.....	.....
.67	30 03	171 06	.....	.....	.....	42 11	−54	41 17	0.2807	0.0004	0.2811
.67	30 02	171 06	− 6 53	0	− 6 53	.....	.....	.....	.....	.....	.....
.67	29 18	170 42	− 6 31	− 1	− 6 32	.....	.....	.....	.....	.....	.....
.67	29 06	170 39	.....	.....	.....	40 55	−57	39 58	0.2827	0.0004	0.2831
.67	28 57	170 35	− 6 23	− 1	− 6 24	.....	.....	.....	.....	.....	.....
.67	28 39	170 16	− 6 45	− 2	− 6 47	.....	.....	.....	.....	.....	.....
.67	28 10	170 05	.....	.....	.....	39 56	−58	38 58	0.2861	0.0006	0.2867
.67	27 59	170 04	− 6 22	− 2	− 6 24	.....	.....	.....	.....	.....	.....
.67	27 41	170 01	− 6 35	− 3	− 6 38	.....	.....	.....	.....	.....	.....
.68	27 17	169 49	− 6 36	− 3	− 6 39	.....	.....	.....	.....	.....	.....
.68	26 44	169 23	− 6 24	− 3	− 6 27	.....	.....	.....	.....	.....	.....
.68	25 50	168 43	.....	.....	.....	36 34	−62	35 32	0.2918	0.0007	0.2925
.68	25 37	168 35	− 6 23	− 4	− 6 27	.....	.....	.....	.....	.....	.....
.68	23 19	167 30	− 6 30	− 5	− 6 35	.....	.....	.....	.....	.....	.....
.68	22 09	167 06	.....	.....	.....	31 56	−73	30 43	0.3009	0.0009	0.3018
.68	21 56	167 02	− 6 18	− 6	− 6 24	.....	.....	.....	.....	.....	.....
.68	20 17	167 10	.....	.....	.....	29 17	−81	27 56	0.3038	0.0010	0.3048
.68	21 27	169 07	− 6 49	− 8	− 6 57	.....	.....	.....	.....	.....	.....
.68	21 30	169 19	.....	.....	.....	31 08	−82	29 46	0.3004	0.0008	0.3012
.68	21 31	169 22	− 6 58	− 8	− 7 06	.....	.....	.....	.....	.....	.....
.69	21 21	169 47	− 7 20	− 8	− 7 28	.....	.....	.....	.....	.....	.....
.69	21 15	169 19	.....	.....	.....	30 38	−83	29 15	0.3025	0.0008	0.3033
.69	21 02	168 32	− 7 06	− 7	− 7 13	.....	.....	.....	.....	.....	.....
.69	21 01	168 30	.....	.....	.....	30 24	−81	29 03	0.3028	0.0008	0.3036
.69	20 40	168 13	− 6 59	− 8	− 7 07	.....	.....	.....	.....	.....	.....
.69	20 39	168 07	.....	.....	.....	29 46	−82	28 24	0.3036	0.0009	0.3045
.69	20 37	168 04	− 6 53	− 8	− 7 01	.....	.....	.....	.....	.....	.....
.70	20 18	167 41	− 6 57	− 8	− 7 05	.....	.....	.....	.....	.....	.....
.70	19 50	167 06	.....	.....	.....	28 07	−59	27 08	0.3074	0.0009	0.3083
.70	19 44	166 55	− 6 34	− 7	− 6 41	.....	.....	.....	.....	.....	.....
.70	19 14	166 28	− 6 57	− 7	− 7 04	.....	.....	.....	.....	.....	.....
.70	18 45	166 11	.....	.....	.....	26 09	−64	25 05	0.3121	0.0010	0.3131
.70	18 36	166 06	− 6 37	− 6	− 6 43	.....	.....	.....	.....	.....	.....
.70	17 32	165 33	− 6 34	− 7	− 6 41	.....	.....	.....	.....	.....	.....
.70	16 43	165 21	.....	.....	.....	22 32	−73	21 19	0.3170	0.0011	0.3181
.70	16 34	165 21	− 7 05	− 7	− 7 12	.....	.....	.....	.....	.....	.....

Table 38.—RESULTS OF OCEAN MAGNETIC OBSERVATIONS BY THE CARNEGIE INSTITUTION OF WASHINGTON AND CORRESPONDING VALUES REDUCED TO 1933.0—Continued.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1915	° ′	° ′	° ′	′	° ′	° ′	′	° ′	C.G.S.	C.G.S.	C.G.S.
.70	15 29	165 17	− 6 41	− 8	− 6 49	.....	.....	.....	.....	.....	.....
1912											
.00	− 5 15	123 24	− 2 52	−10	− 3 02	.....	.....	.....	.....	.....	.....
.00	− 4 39	123 30	.....	.....	.....	−24 59	−62	−26 01	0.3782	0.0020	0.3802
.01	− 3 53	123 39	− 2 48	− 9	− 2 57	.....	.....	.....	.....	.....	.....
.01	− 3 34	123 51	.....	.....	.....	−22 57	−59	−23 56	0.3792	0.0020	0.3812
.01	− 3 09	124 04	− 2 41	− 8	− 2 49	.....	.....	.....	.....	.....	.....
.01	− 2 59	124 24	.....	.....	.....	−21 32	−58	−22 30	0.3807	0.0020	0.3827
.01	− 3 01	124 29	− 2 49	− 8	− 2 57	.....	.....	.....	.....	.....	.....
.01	− 2 34	124 29	− 2 52	− 7	− 2 59	.....	.....	.....	.....	.....	.....
.01	− 2 34	124 42	.....	.....	.....	−20 32	−58	−21 30	0.3815	0.0020	0.3835
.02	− 2 52	125 45	− 2 50	− 7	− 2 57	.....	.....	.....	.....	.....	.....
.02	− 3 15	125 56	.....	.....	.....	−21 46	−59	−22 45	0.3801	0.0020	0.3821
.02	− 3 31	126 00	− 2 54	− 8	− 3 02	.....	.....	.....	.....	.....	.....
.02	− 2 49	127 50	.....	.....	.....	−20 46	−58	−21 44	0.3820	0.0020	0.3840
.03	− 1 39	128 15	.....	.....	.....	−18 08	−56	−19 04	0.3786	0.0021	0.3807
.03	− 1 18	128 26	− 2 59	− 5	− 3 04	.....	.....	.....	.....	.....	.....
.03	− 1 07	128 33	− 2 50	− 5	− 2 55	.....	.....	.....	.....	.....	.....
.03	− 0 41	128 52	.....	.....	.....	−16 16	−55	−17 11	0.3833	0.0021	0.3854
.03	− 0 36	128 49	− 3 01	− 5	− 3 06	.....	.....	.....	.....	.....	.....
.04	− 0 08	128 26	− 3 01	− 4	− 3 05	.....	.....	.....	.....	.....	.....
.04	0 24	129 28	− 2 37	− 3	− 2 40	.....	.....	.....	.....	.....	.....
.04	0 28	129 34	− 2 32	− 3	− 2 35	.....	.....	.....	.....	.....	.....
.05	0 47	130 25	.....	.....	.....	−12 41	−53	−13 34	0.3824	0.0021	0.3845
.05	0 49	130 54	− 2 48	− 4	− 2 52	.....	.....	.....	.....	.....	.....
.05	0 44	131 13	.....	.....	.....	−12 52	−53	−13 45	0.3810	0.0021	0.3831
.05	0 38	131 27	− 2 49	− 3	− 2 52	.....	.....	.....	.....	.....	.....
.05	0 26	132 24	− 3 05	− 3	− 3 08	.....	.....	.....	.....	.....	.....
.05	0 23	132 51	.....	.....	.....	−13 19	−53	−14 12	0.3805	0.0021	0.3826
.05	1 05	135 41	.....	.....	.....	−11 33	−52	−12 25	0.3783	0.0021	0.3804
.05	1 17	135 55	− 3 03	− 2	− 3 05	.....	.....	.....	.....	.....	.....
.06	2 10	136 47	− 3 14	− 2	− 3 16	.....	.....	.....	.....	.....	.....
.06	2 36	137 31	.....	.....	.....	− 8 05	−50	− 8 55	0.3761	0.0021	0.3782
.06	3 08	138 32	− 3 19	0	− 3 19	.....	.....	.....	.....	.....	.....
.06	4 10	137 41	− 3 03	+ 1	− 3 02	.....	.....	.....	.....	.....	.....
.06	4 49	137 20	.....	.....	.....	− 3 43	−46	− 4 29	0.3745	0.0022	0.3767
.06	5 02	137 13	− 2 52	+ 2	− 2 50	.....	.....	.....	.....	.....	.....
.07	6 32	136 37	− 2 30	+ 3	− 2 27	.....	.....	.....	.....	.....	.....
.07	7 23	136 13	.....	.....	.....	1 52	−42	1 10	0.3718	0.0023	0.3741
.07	7 38	136 01	− 2 02	+ 5	− 1 57	.....	.....	.....	.....	.....	.....
.07	8 45	135 29	− 2 02	+ 6	− 1 56	.....	.....	.....	.....	.....	.....

Table 38.—RESULTS OF OCEAN MAGNETIC OBSERVATIONS BY THE CARNEGIE INSTITUTION OF WASHINGTON AND CORRESPONDING VALUES REDUCED TO 1933.0—Continued.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1912	° ′	° ′	° ′	′	° ′	° ′	′	° ′	C.G.S.	C.G.S.	C.G.S.
.07	9 16	134 51	.....	.....	.....	5 24	−39	4 45	0.3718	0.0023	0.3741
.07	9 30	134 29	− 1 51	7	− 1 44	.....	.....	.....	.....	.....	.....
.07	11 25	132 33	.....	.....	.....	9 46	−36	9 10	0.3729	0.0024	0.3753
.07	11 38	132 19	− 1 20	9	− 1 11	.....	.....	.....	.....	.....	.....
.07	12 45	131 04	− 0 52	11	− 0 41	.....	.....	.....	.....	.....	.....
.07	13 25	130 17	.....	.....	.....	13 33	−33	13 00	0.3730	0.0024	0.3754
.07	13 42	130 01	− 1 00	12	− 0 48	.....	.....	.....	.....	.....	.....
.08	14 59	128 45	− 0 32	14	− 0 18	.....	.....	.....	.....	.....	.....
.08	15 35	128 06	.....	.....	.....	18 17	−27	17 50	0.3700	0.0025	0.3725
.08	16 42	126 54	− 0 16	17	0 01	.....	.....	.....	.....	.....	.....
.08	17 23	126 12	.....	.....	.....	21 48	−27	21 21	0.3688	0.0025	0.3713
.08	18 39	123 08	.....	.....	.....	24 07	−27	23 40	0.3718	0.0024	0.3742
.08	18 42	120 38	− 0 04	18	0 14	.....	.....	.....	.....	.....	.....
.08	17 33	119 55	.....	.....	.....	21 46	−27	21 19	0.3795	0.0024	0.3819
.08	17 22	119 51	− 0 17	17	0 00	.....	.....	.....	.....	.....	.....
.09	15 46	119 37	− 0 29	14	− 0 15	.....	.....	.....	.....	.....	.....
.09	14 56	119 57	.....	.....	.....	.....	.....	.....	0.3829	0.0024	0.3853
.09	14 38	120 10	− 1 01	13	− 0 48	.....	.....	.....	.....	.....	.....
.09	14 18	120 28	− 0 52	13	− 0 39	.....	.....	.....	.....	.....	.....
.23	14 23	120 24	− 1 02	13	− 0 49	.....	.....	.....	.....	.....	.....
.23	14 54	119 58	− 0 52	14	− 0 38	.....	.....	.....	.....	.....	.....
.23	15 14	119 49	.....	.....	.....	16 56	−27	16 29	0.3836	0.0024	0.3860
.23	16 02	119 17	.....	.....	.....	18 46	−27	18 19	0.3836	0.0024	0.3860
.23	16 19	119 20	− 0 36	16	− 0 20	.....	.....	.....	.....	.....	.....
.24	17 10	119 34	− 0 26	17	− 0 09	.....	.....	.....	.....	.....	.....
.24	17 57	119 17	.....	.....	.....	22 29	−27	22 02	0.3795	0.0024	0.3819
.24	18 03	119 12	− 0 10	18	0 08	.....	.....	.....	.....	.....	.....
.24	18 36	118 48	.....	.....	.....	23 51	−27	23 24	0.3785	0.0024	0.3809
.24	18 40	118 49	− 0 08	18	0 10	.....	.....	.....	.....	.....	.....
.25	18 40	120 15	− 0 18	18	0 00	.....	.....	.....	.....	.....	.....
.25	20 07	120 05	.....	.....	.....	26 44	−27	26 17	0.3727	0.0024	0.3751
.25	21 50	119 12	.....	.....	.....	30 14	−27	29 47	0.3695	0.0024	0.3719
.25	21 37	119 40	− 0 31	22	− 0 09	.....	.....	.....	.....	.....	.....
.25	21 17	120 09	.....	.....	.....	29 10	−27	28 43	0.3696	0.0024	0.3720
.25	21 03	120 18	0 31	22	0 53	.....	.....	.....	.....	.....	.....
.26	19 32	120 32	.....	.....	.....	25 46	−27	25 19	0.3751	0.0024	0.3775
.26	20 19	120 41	.....	.....	.....	27 17	−27	26 50	0.3709	0.0024	0.3733
.26	20 08	120 54	0 19	20	0 39	.....	.....	.....	.....	.....	.....
.27	19 12	122 26	0 23	19	0 42	.....	.....	.....	.....	.....	.....
.27	20 17	122 20	0 22	20	0 42	.....	.....	.....	.....	.....	.....
.27	20 01	122 24	.....	.....	.....	28 41	−27	28 14	0.3670	0.0024	0.3694

Table 38.—RESULTS OF OCEAN MAGNETIC OBSERVATIONS BY THE CARNEGIE INSTITUTIONS OF WASHINGTON AND CORRESPONDING VALUES REDUCED TO 1933.0—Continued.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1912	° ′	° ′	° ′	′	° ′	° ′	′	° ′	C.G.S.	C.G.S.	C.G.S.
.27	21 14	122 25	0 46	22	1 08	.....	.....	.....	.....	.....	.....
.27	22 20	122 28	0 54	23	1 17	.....	.....	.....	.....	.....	.....
.27	22 57	122 48	.....	.....	.....	32 18	−27	31 51	0.3619	0.0026	0.3645
.27	23 19	123 48	.....	.....	.....	32 49	−27	32 22	0.3578	0.0024	0.3602
.28	22 32	126 25	.....	.....	.....	31 20	−27	30 53	0.3581	0.0027	0.3608
.28	23 35	127 13	.....	.....	.....	33 04	−27	32 37	0.3536	0.0024	0.3560
.28	24 53	127 59	1 43	25	2 08	.....	.....	.....	.....	.....	.....
.28	25 35	128 52	.....	.....	.....	36 26	−27	35 59	0.3453	0.0019	0.3472
.29	26 09	129 51	2 16	25	2 41	.....	.....	.....	.....	.....	.....
.29	26 26	130 41	.....	.....	.....	37 40	−27	37 13	0.3373	0.0018	0.3391
.29	26 47	132 18	2 33	25	2 58	.....	.....	.....	.....	.....	.....
.29	26 30	133 26	.....	.....	.....	37 14	−35	36 39	0.3381	0.0017	0.3398
.29	27 10	134 09	.....	.....	.....	38 13	−33	37 40	0.3333	0.0014	0.3347
.30	30 41	136 42	.....	.....	.....	43 01	−17	42 44	0.3181	0.0007	0.3188
.30	30 40	137 06	3 28	26	3 54	.....	.....	.....	.....	.....	.....
.30	30 40	138 42	3 29	27	3 56	.....	.....	.....	.....	.....	.....
.30	30 37	139 01	.....	.....	.....	42 43	−18	42 25	0.3147	0.0007	0.3154
.30	30 35	139 07	3 11	27	3 38	.....	.....	.....	.....	.....	.....
.31	30 41	142 59	.....	.....	.....	42 23	−18	42 05	0.3106	0.0006	0.3112
.31	30 47	143 25	2 51	25	3 16	.....	.....	.....	.....	.....	.....
.31	30 58	145 29	2 28	24	2 52	.....	.....	.....	.....	.....	.....
.31	31 01	146 47	.....	.....	.....	42 37	−16	42 21	0.3049	0.0004	0.3053
.31	31 01	147 13	2 23	24	2 47	.....	.....	.....	.....	.....	.....
.31	31 12	149 05	.....	.....	.....	42 29	−16	42 13	0.3048	0.0003	0.3051
.32	31 16	150 34	1 09	23	1 32	.....	.....	.....	.....	.....	.....
.32	31 14	152 03	.....	.....	.....	42 22	−16	42 06	0.3001	0.0003	0.3004
.32	31 09	152 31	0 35	22	0 57	.....	.....	.....	.....	.....	.....
.32	30 38	154 37	− 0 29	19	− 0 10	.....	.....	.....	.....	.....	.....
.32	30 28	156 18	.....	.....	.....	41 07	−21	40 46	0.2966	0.0002	0.2968
.32	30 27	156 50	− 0 59	18	− 0 41	.....	.....	.....	.....	.....	.....
.32	30 26	158 43	− 1 46	17	− 1 29	.....	.....	.....	.....	.....	.....
.32	30 32	160 22	.....	.....	.....	41 38	−23	41 15	0.2897	0.0001	0.2898
.32	30 34	160 51	− 2 28	14	− 2 14	.....	.....	.....	.....	.....	.....
.32	30 33	162 49	− 3 31	13	− 3 18	.....	.....	.....	.....	.....	.....
.32	30 31	164 23	.....	.....	.....	41 56	−25	41 31	0.2862	− 0.0001	0.2861
.33	30 16	166 43	.....	.....	.....	41 58	−26	41 32	0.2837	− 0.0003	0.2834
.33	29 51	167 24	− 5 25	7	− 5 18	.....	.....	.....	.....	.....	.....
.33	28 54	168 18	.....	.....	.....	40 49	−34	40 15	0.2863	− 0.0002	0.2861
.33	28 37	168 35	− 6 00	3	− 5 57	.....	.....	.....	.....	.....	.....
.33	27 15	169 53	− 6 50	− 1	− 6 51	.....	.....	.....	.....	.....	.....
.33	26 05	170 44	.....	.....	.....	37 56	−50	37 06	0.2883	0.0001	0.2884

Table 38.—RESULTS OF OCEAN MAGNETIC OBSERVATIONS BY THE CARNEGIE INSTITUTION OF WASHINGTON AND CORRESPONDING VALUES REDUCED TO 1933.0—Continued.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1912	° ′	° ′	° ′	′	° ′	° ′	′	° ′	C.G.S.	C.G.S.	C.G.S.
.33	25 46	171 00	− 7 08	− 5	− 7 13	.....	.....	.....	.....	.....	.....
.33	24 24	171 36	− 7 35	− 7	− 7 42	.....	.....	.....	.....	.....	.....
.33	23 13	171 48	.....	.....	.....	34 31	− 67	33 24	0.2954	0.0004	0.2958
.33	22 51	171 55	− 7 49	−10	− 7 59	.....	.....	.....	.....	.....	.....
.34	20 11	172 52	.....	.....	.....	30 41	− 87	29 14	0.3023	0.0006	0.3029
.34	19 49	172 56	− 8 18	−15	− 8 33	.....	.....	.....	.....	.....	.....
.34	18 34	173 15	− 8 28	−17	− 8 45	.....	.....	.....	.....	.....	.....
.34	17 43	173 28	.....	.....	.....	27 10	−104	25 26	0.3071	0.0009	0.3080
.34	16 04	173 47	− 8 44	−20	− 9 04	.....	.....	.....	.....	.....	.....
.34	15 09	174 06	.....	.....	.....	23 31	−121	21 30	0.3147	0.0010	0.3157
.35	13 24	174 57	− 8 41	−24	− 9 05	.....	.....	.....	.....	.....	.....
1911											
.99	− 5 43	119 58	− 2 34	−11	− 2 45	.....	.....	.....	.....	.....	.....
.99	− 5 36	120 14	− 0 56	−11	− 1 07	.....	.....	.....	.....	.....	.....
.99	− 5 36	120 14	− 0 57	−11	− 1 08	−28 04	− 63	−29 07	0.3709	0.0020	0.3729
.99	− 5 43	121 00	− 2 34	−11	− 2 45	.....	.....	.....	.....	.....	.....
.99	− 5 43	121 14	.....	.....	.....	−27 23	− 63	−28 26	0.3771	0.0020	0.3791

Table 39.—RESULTS OF MAGNETIC OBSERVATIONS IN KARAFUTO BY THE HYDROGRAPHIC DEPARTMENT OF JAPAN AND CORRESPONDING VALUES REDUCED TO 1933.0.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1900+	° ′	° ′	° ′	′	° ′	° ′	′	° ′	γ	γ	γ
19.55	54 21.2	142 40.2	8 54.8	44.7	9 39.5	.....	.....	.....	.....	.....	.....
19.56	54 19.3	142 35.7	9 38.5	44.7	10 23.2	.....	.....	.....	.....	.....	.....
19.55	54 10.9	142 26.3	7 59.1	44.3	8 43.4	.....	.....	.....	.....	.....	.....
19.61	53 42.2	142 35.6	9 07.2	43.0	9 50.2	.....	.....	.....	.....	.....	.....
19.64	53 22.6	141 46.7	10 50.7	42.4	11 33.1	.....	.....	.....	.....	.....	.....
19.50	53 15.4	141 47.8	7 06.0	42.9	7 48.9	.....	.....	.....	.....	.....	.....
19.57	52 51.6	143 18.3	9 04.0	41.2	9 45.2	66 04.0	6.5	66 10.5	21970	−154	21816
20.50	52 44.	141 49.	10 36.6	37.5	11 14.1	66 16.0	6.3	66 22.3	.....	.....	.....
20.50	52 10.	141 40.	10 38.7	36.6	11 15.3	65 38.1	6.3	65 44.4	.....	.....	.....
19.53	51 58.5	143 11.0	9 14.7	39.8	9 54.5	65 14.0	6.6	65 20.6	22661	−141	22520
20.50	51 44.	141 45.	10 04.5	35.7	10 40.2	64 51.0	6.3	64 57.3	.....	.....	.....

Table 39.—RESULTS OF MAGNETIC OBSERVATIONS IN KARAFUTO BY THE HYDROGRAPHIC DEPARTMENT OF JAPAN AND CORRESPONDING VALUES REDUCED TO 1933.0—Continued.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
1900+	° ′	° ′	° ′	′	° ′	° ′	′	° ′	γ	γ	γ
19.62	50 54.3	143 38.3	8 36.5	37.2	9 13.7	64 13.0	6.5	64 19.5	23061	−124	22937
20.50	50 50.	142 09.	9 48.8	34.1	10 22.9	64 23.0	6.3	64 29.3	.....	.....	.....
19.64	50 22.1	143 46.6	8 01.0	36.0	8 37.0	64 06.0	6.5	64 12.5	23015	−117	22898
20.50	50 02.	142 08.	9 42.2	32.9	10 15.1	63 29.0	6.3	63 35.3	.....	.....	.....

Table 40.—RESULTS OF MAGNETIC OBSERVATIONS IN SIBERIA BY THE CENTRAL GEOPHYSICAL OBSERVATORY OF U. S. S. R. AND CORRESPONDING VALUES FOR 1933.0.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
	° ′	° ′	° ′	′	° ′	° ′	′	° ′	C.G.S.	C.G.S.	C.G.S.
1929	64 42	153 15	7 21	35	7 56	75 00	− 1	74 59	0.1472	− 0.0004	0.1468
1930	64 31	157 15	6 16	26	6 42	54 39	− 1	54 38	0.1491	− 0.0002	0.1489
1930	64 28	161 07	3 01	26	3 27	74 01	− 2	73 59	0.1535	− 0.0002	0.1533
1929	63 59	154 14	6 45	34	7 19	74 14	− 1	74 13	0.1536	− 0.0003	0.1533
1930	63 49	160 00	3 48	26	4 14	73 32	− 2	73 30	0.1579	− 0.0002	0.1577
1930	63 43	158 09	5 49	25	6 14	73 18	− 1	73 17	0.1605	− 0.0002	0.1603
1929	63 16	143 13	10 47	32	11 19	75 02	0	75 02	0.1489	− 0.0004	0.1485
1930	63 16	143 13	10 55	24	11 19	75 03	0	75 03	0.1475	− 0.0003	0.1472
1929	63 10	145 38	10 05	31	10 36	74 43	0	74 43	0.1516	− 0.0004	0.1512
1929	62 53	152 25	7 54	32	8 26	73 35	0	73 35	0.1600	− 0.0003	0.1597
1929	62 48	150 41	8 40	32	9 12	73 44	0	73 44	0.1586	− 0.0004	0.1582
1929	62 43	150 50	7 44	32	8 16	76 15	0	76 15	0.1364	− 0.0004	0.1360
1929	62 27	152 15	7 55	32	8 27	73 14	0	73 14	0.1619	− 0.0003	0.1616
1929	62 24	151 48	8 34	32	9 06	73 02	0	73 02	0.1692	− 0.0003	0.1689
1930	61 01	172 08	− 3 38	17	− 3 21	70 57	− 2	70 55	0.2275	− 0.0001	0.2274
1930	60 33	167 50	− 0 06	19	0 13	70 29	− 2	70 27	0.2350	0.0000	0.2350
1929	60 32	168 42	− 1 14	24	− 0 50	70 52	− 3	70 49	0.1782	− 0.0001	0.1781
1929	60 27	166 14	− 0 17	25	0 08	70 49	− 2	70 47	0.1763	0.0000	0.1763
1929	60 27	166 15	− 0 04	25	0 21	71 04	− 2	71 02	0.1764	0.0000	0.1764
1929	60 27	169 34	− 1 26	24	− 1 02	70 28	− 3	70 25	0.1826	− 0.0001	0.1825
1929	60 25	134 32	10 22	31	10 53	74 11	+ 2	74 13	.....	.....	.....
1930	60 25	167 04	0 07	19	0 26	70 21	− 2	70 19	0.2350	0.0000	0.2350
1930	60 21	170 37	2 16	18	2 34	70 19	− 2	70 17	0.2330	− 0.0001	0.2329
1929	60 19	167 06	− 0 16	24	0 08	70 59	− 3	70 56	0.1784	0.0000	0.1784

Table 40.—RESULTS OF MAGNETIC OBSERVATIONS IN SIBERIA BY THE CENTRAL GEOPHYSICAL OBSERVATORY OF U. S. S. R. AND CORRESPONDING VALUES FOR 1933.0—Continued.

Date	Position		Declination			Dip			Horizontal Intensity		
	Latitude	Longitude	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value	Observed Value	Red. to 1933.0	Reduced Value
	° ′	° ′	° ′	′	° ′	° ′	′	° ′	C.G.S.	C.G.S.	C.G.S.
1929	60 06	132 52	12 27	30	12 57	.....	.....	.....	.....	.....	.....
1929	60 02	165 09	0 37	24	1 01	70 56	— 2	70 54	0.1772	0.0000	0.1772
1930	60 01	170 26	— 1 37	18	— 1 19	71 01	— 2	70 59	.....	.....	.....
1930	59 52	163 42	1 57	18	2 15	69 51	— 2	69 49	.....	.....	.....
1929	59 49	166 06	1 26	24	1 50	69 24	— 2	69 22	0.1862	0.0000	0.1862
1929	59 47	164 53	2 10	24	2 34	70 03	— 2	70 01	0.1916	0.0000	0.1916
1930	59 02	163 08	.....	...	.....	69 57	— 2	69 55	0.2390	0.0000	0.2390
1929	56 45	128 42	9 00	27	9 27	.....	.....	.....	.....	.....	.....
1929	56 32	127 54	13 09	27	13 36	.....	.....	.....	.....	.....	.....
1929	56 17	128 41	11 08	27	11 35	.....	.....	.....	.....	.....	.....
1930	56 12	161 41	2 10	17	2 27	68 40	— 2	68 38	.....	.....	.....
1929	56 10	162 25	.....	...	.....	67 10	— 2	67 08	0.2058	0.0000	0.2058
1929	56 05	126 24	8 07	26	8 33	.....	.....	.....	.....	.....	.....
1929	55 55	124 56	8 00	26	8 26	.....	.....	.....	.....	.....	.....
1929	55 15	165 54	1 18	20	1 38	66 51	— 2	66 49	0.2100	0.0002	0.2102
1929	55 12	165 59	0 57	20	1 17	66 53	— 2	66 51	0.2082	0.0002	0.2084
1929	55 11	165 57	0 41	20	1 01	66 20	— 2	66 18	0.2088	0.0002	0.2090
1929	54 48	167 01	0 18	18	0 36	65 51	— 3	65 48	0.2059	0.0002	0.2061
1926	53 44	119 46	7 23	42	8 05	.....	.....	.....	.....	.....	.....
1929	53 01	158 39	4 01	21	4 22	64 19	— 2	64 17	0.2222	0.0000	0.2222
1930	53 00	158 38	3 20	16	3 36	64 14	— 1	64 13	0.2839	0.0000	0.2839
1926	52 02	113 30	4 31	39	5 10	70 13	9	70 22	0.2005	— 0.0021	0.1984
1926	52 02	113 31	5 05	39	5 44	.....	.....	.....	.....	.....	.....
1926	51 38	114 21	5 08	38	5 46	.....	.....	.....	.....	.....	.....
1926	51 07	114 32	5 25	37	6 02	.....	.....	.....	.....	.....	.....
1926	50 56	115 36	5 20	37	5 57	.....	.....	.....	.....	.....	.....
1927	50 34	137 14	.....	...	.....	65 24	1	65 25	.....	.....	.....
1926	50 16	127 31	9 32	34	10 06	66 27	5	66 32	0.2259	— 0.0015	0.2244
1926	49 51	136 45	9 13	32	9 45	.....	.....	.....	.....	.....	.....
1926	49 51	136 45	9 10	32	9 42	64 27	1	64 28	0.2305	— 0.0010	0.2295
1930	49 18	140 23	9 32	13	9 45	63 59	1	64 00	.....	.....	.....
1930	46 33	138 21	8 50	10	9 00	61 34	1	61 35	.....	.....	.....
1927	43 11	131 47	8 12	19	8 31	58 46	3	58 49	.....	.....	.....
1628	43 02	131 35	7 59	16	8 15	62 54	3	62 57	.....	.....	.....
1927	42 49	132 54	8 07	18	8 25	.....	.....	.....	.....	.....	.....
1927	42 27	130 47	8 23	19	8 42	.....	.....	.....	.....	.....	.....

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS.

Tisima Rettô (千 島 列 島)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
Simusyu Tô 占 守 島	50 43.3	156 11.9	1917.50	2 05.7	.....	.....	A
			33.66	4 27.9	63 16.6	22879	A
Onekotan Tô 溫 禰 古 丹 島	49 27.4	154 42.4	1915.50	3 49.4	.....	.....	A
			33.64	3 44.5	61 00.0	23868	A
Syasukotan Tô 捨 子 古 丹 島	48 46.9	154 02.6	1916.50	3 39.5	.....	.....	A
			33.66	4 39.0	60 56.5	23844	C
Ketoi Tô 計 吐 夷 島	47 18.2	152 29.0	1917.50	4 41.6	.....	.....	A
			33.70	5 13.9	59 36.5	24571	A
Simusiru Tô, 2 新 知 島	46 51.5	151 51.8	1916.50	4 31.0	.....	.....	A
			33.71	5 24.9	58 46.0	25232	B
Etorohu Sima, 1 擇 捉 島	45 13.5	147 52.6	1912.45	5 47.5	57 50.8	25828	A
			32.81	6 02.1	57 47.4	25887	B
Kunasiri Sima 國 後 島	44 01.4	145 51.7	1912.42	5 40.7	57 15.9	26504	A
			33.72	6 12.4	56 39.2	26796	C
Sikotan Sima 色 丹 島	43 51.8	146 49.8	1923.54	6 02.0	57 57.5	25944	A
			32.77	6 14.4	57 45.0	26102	B

Karahuto (樺 太)

Sikuka, 2 敷 香	49 13.5	143 06.9	1912.67	8 04.5	62 50.9	23918	A
			22.53	8 46.7	62 53.6	23867	A
			32.71	9 09.0	62 59.0	23799	B
Usiro 鵜 城	48 50.5	141 57.1	1912.78	8 22.4	62 32.9	24192	A
			22.48	8 54.8	62 35.2	24111	A
			32.69	9 22.0	62 41.8	24047	B
Kaihyô Tô 海 豹 島	48 30.1	144 37.6	1912.64	7 32.0	61 48.3	24569	A
			32.72	8 32.1	61 56.7	24453	A
Maoka, 1 眞 岡	47 02.6	142 03.2	1912.56	8 06.8	60 48.9	25194	A
			22.46	8 43.0	60 50.4	25096	A
			32.67	9 07.0	60 54.5	25065	B
Toyohara 豐 原	46 57.4	142 45.2	1912.61	7 56.1	60 35.7	25189	A
			22.50	8 37.1	60 42.4	25162	A
			32.72	8 50.2	90 43.7	25077	C
Ôtomari 大 泊	46 38.8	142 46.5	1912.58	7 41.3	60 13.7	25397	A
			22.58	8 17.1	60 23.8	25304	C
			32.73	8 36.8	60 24.1	25268	C
Kaiba Tô, 1 海 馬 島	46 16.9	141 13.1	1912.55	7 36.6	60 17.2	25537	A
			32.63	8 11.1	60 51.4	25354	B
Kaiba Tô, 2 海 馬 島	46 15.6	141 15.3	1912.54	5 50.5	60 41.4	25466	A
			32.63	6 53.2	62 24.0	24769	B

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Hokkaidô (北 海 道)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
稚内 Wakkanai	45 25.3	141 40.5	1894.71	6 48.6	59 17.3	25782	B
			1912.49	7 46.2	59 18.1	25978	A
			22.70	8 20.5	59 18.9	25961	B
			32.74	8 42.3	59 21.7	25932	A
紋別 Monbetu	44 20.9	143 20.9	1894.74	5 59.6	57 53.6	26232	B
			1912.53	6 58.3	57 54.1	26403	A
			22.69	7 31.8	57 58.9	26366	A
			32.75	7 48.6	58 00.2	26307	B
留萌 Rumoi	43 56.7	141 38.2	1912.87	7 30.4	57 35.4	26776	A
			22.61	7 41.1	57 56.8	26598	B
			33.75	8 19.7	57 36.8	26778	A
標津 Sibetu	43 39.3	145 08.4	1894.79	5 04.1	57 16.9	26181	C
			1912.57	6 19.9	57 21.8	26370	A
			22.66	6 51.4	57 23.2	26318	A
			32.79	7 09.6	57 20.5	26318	B
札幌 Sapporo, 1	43 04.3	141 21.0	1887.55	6 00.0	56 41.5	26766	
			94.55	6 09.3	57 10.1	26494	B
			1912.84	7 00.5	57 01.0	26830	A
			22.65	7 29.6	57 03.9	26773	A
			32.86	7 56.2	56 52.0	26896	B
白糠 Siranuka	42 57.1	144 04.8	1894.72	5 04.1	56 40.3	26771	C
			1912.61	5 57.3	56 32.5	26895	A
			22.67	6 30.2	56 38.5	26864	A
			32.80	6 47.4	56 40.0	26805	A
佐瑠太 Saruhuto	42 30.8	142 02.4	1894.59	6 00.0	56 26.8	26985	B
			1912.88	6 51.1	56 25.6	27114	A
			22.61	7 17.0	56 36.5	26995	B
			33.61	7 40.2	56 31.3	27063	B
瀬棚 Setana	42 26.9	139 51.5	1894.53	6 03.9	56 13.8	27393	B
			1912.42	6 54.1	56 17.1	27545	A
			22.45	7 29.6	56 19.8	27436	A
			32.75	7 37.0	56 18.4	27485	A
廣尾 Biro-o	42 17.1	143 19.1	1894.65	5 17.8	55 53.8	27112	A
			1912.64	6 11.2	55 47.2	27321	A
			22.63	6 45.0	55 46.9	27256	A
			32.86	6 58.3	55 49.1	27252	A
森 Mori	42 06.1	140 34.8	1894.51	5 39.1	56 15.5	27179	B
			1912.89	6 30.8	55 53.8	27458	A
			22.44	7 17.0	56 06.6	27412	A
			32.74	7 17.4	56 12.9	27324	B
福山 Hukuyama	41 25.7	140 06.7	1894.55	5 47.7	55 07.0	27764	C
			1912.40	6 32.5	54 54.8	28136	A
			33.62	7 19.7	54 56.8	28072	B

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Honsyû (本 洲)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
野邊地 Nohezi	40 52.2	141 06.3	1887.53	5 31.7	54 44.1	27576	
			95.67	5 53.2	54 42.1	27692	C
			1912.36	6 40.6	54 37.3	27950	A
			22.57	7 01.1	54 37.3	27874	A
			32.76	7 29.5	54 48.4	27837	B
鯵ヶ澤 Azigasawa	40 46.5	140 12.8	1895.64	5 34.5	54 46.2	27763	A
			1912.69	6 22.3	54 47.0	28024	A
			22.58	6 46.1	54 47.5	27955	A
			33.76	7 03.1	54 50.8	27965	A
久慈 Kuzi	40 11.5	141 47.1	1887.52	4 37.7	54 07.4	27983	
			95.54	5 03.6	54 21.2	28035	B
			1912.35	5 47.8	54 00.2	28291	A
			22.56	6 15.0	54 03.9	28234	A
			32.77	6 30.7	54 02.8	28262	A
秋田 Akita, 2	39 42.5	140 07.6	1887.59	5 09.3	53 37.6	28275	
			95.62	5 23.2	53 32.8	28301	A
			1912.72	6 10.4	53 33.3	28543	A
			22.60	6 31.4	53 33.0	28520	A
			32.72	6 49.1	53 30.1	28533	A
酒田 Sakata	38 54.4	139 50.8	1887.60	5 11.0	52 51.9	28465	
			95.61	5 13.2	52 44.3	28651	C
			1912.77	5 57.5	52 40.8	28825	A
			22.65	6 24.7	52 42.9	28816	A
			33.76	6 38.6	52 42.5	28813	C
女川 Onagawa	38 26.7	141 26.9	1913.34	5 32.7	51 54.7	28780	A
			32.78	6 06.7	51 54.9	28777	A
仙臺 Sendai, 1	38 15.6	140 54.0	1894.93	5 06.1	.....	.....	B
			95.12	.....	51 57.3	28619	B
			1913.33	5 55.3	51 50.9	28853	A
			22.53	6 07.0	51 51.2	28781	B
			33.78	6 21.0	51 56.2	28813	B
仙臺 Sendai, 2	38 14.5	140 51.6	1913.34	5 58.9	51 54.6	28822	A
			33.77	6 48.5	52 02.0	28792	C
夷 Ebisu	38 05.1	138 25.7	1887.62	5 00.0	52 03.7	28950	
			93.67	5 43.0	51 52.9	29000	B
			1912.80	6 00.9	51 49.2	29234	A
			33.79	6 39.0	51 52.9	29260	B
相川 Aikawa, 2	38 01.1	138 13.6	1893.68	5 20.1	52 11.5	28734	B
			1912.81	5 51.7	51 48.4	29224	A
			33.79	6 33.6	51 47.3	29231	A

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Honsyû (本 洲)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
新 Nigata, 2 潟	37 55.1	139 02.3	1887.63	5 09.4	51 56.9	28699	
			95.62	5 17.2	51 57.0	28947	B
			1912.80	5 57.4	51 47.0	29102	A
			22.68	6 18.2	51 43.5	29137	A
			32.70	6 35.8	51 53.4	29043	B
輪 Wazima, 1 島	37 23.6	136 53.9	1893.73	5 13.1	51 34.6	29190	B
			1912.37	5 49.9	51 23.0	29617	A
			22.70	6 10.5	51 15.6	29587	B
			32.69	6 29.3	51 21.5	29639	A
糸 Itoigawa 魚 川	37 02.2	137 52.0	1893.77	5 06.5	50 58.2	29285	B
			1912.84	5 45.2	50 55.7	29505	A
			22.69	6 06.7	50 52.9	29490	A
			33.81	6 17.9	50 53.1	29515	B
植 Ueda 田	36 54.9	140 48.3	1912.90	5 11.8	50 20.6	29384	A
			23.08	5 36.3	50 15.5	29399	A
			32.78	5 46.2	50 20.5	29428	B
塩 Sioya 屋	36 17.8	136 15.1	1887.76	4 59.2	50 30.8	29555	
			93.71	5 01.8	50 19.3	29687	B
			1912.35	5 37.5	50 14.3	29952	A
			22.71	6 07.0	50 19.7	29940	A
			33.54	6 05.2	50 16.7	29998	B
西 Saigô 郷	36 12.1	133 20.2	1913.36	6 30.5	51 09.4	30055	A
			33.52	6 54.5	51 03.5	30689	B
菱 Hisiura 浦	36 06.1	133 05.1	1913.35	4 32.9	50 08.6	30414	A
			33.53	5 48.5	50 19.6	30846	B
銚 Tyôsi, 2 子	35 43.8	140 49.7	1887.67	4 19.2	48 43.1	29696	
			95.51	4 13.8	48 56.5	29757	A
			1913.26	4 56.8	48 42.3	29959	A
			23.09	5 12.3	48 26.4	30065	A
			32.80	5 04.6	48 22.7	30219	B
飯 Iida, 1 田	35 31.4	137 49.3	1893.78	4 32.9	.....	.....	A
			93.64	.....	49 06.4	29842	A
			1913.32	5 08.2	49 01.3	30137	A
			22.83	5 31.6	48 51.5	30123	A
			33.81	5 40.8	49 00.6	30160	A
小 Obama 濱	35 30.1	135 44.8	1887.75	4 54.1	49 30.4	30018	
			96.53	4 57.8	49 19.9	30096	B
			1912.34	5 23.1	49 14.0	30424	A
			22.85	5 44.9	49 12.5	30435	A
			32.68	5 58.6	49 12.7	30490	A
鳥 Tottori 取	35 29.9	134 14.4	1896.56	5 06.0	49 41.5	30179	A
			1913.25	5 33.6	49 37.8	30478	A
			22.88	5 54.8	49 35.1	30499	A
			33.54	6 04.7	49 34.7	30562	A

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Honsyû (本 洲)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
今 Imaiti 市	35 21.7	132 45.2	1887.73	4 48.9	50 13.1	30022	
			96.58	4 51.4	49 59.6	30295	A
			1913.37	5 20.0	49 49.3	30484	A
			22.89	5 41.4	49 51.2	30511	A
			32.67	5 55.8	49 52.9	30494	A
鴨 Kamogawa 川	35 05.8	140 06.3	1895.53	4 11.4	48 19.7	29851	B
			1913.28	4 54.0	48 06.8	30030	A
			33.83	5 22.5	48 04.3	30094	A
富 Tomida 田	35 00.2	136 39.1	1913.17	5 15.8	48 34.3	30445	A
			23.03	5 33.0	48 28.5	30452	A
			33.36	5 40.8	48 35.1	30490	A
掛 Kakegawa 川	34 46.4	138 01.0	1913.15	5 00.8	48 04.0	30438	A
			23.04	5 16.5	47 56.4	30426	A
			32.60	5 21.6	48 04.3	30495	A
岡 Okayama, 1 山	34 40.3	133 56.2	1887.57	4 38.1	48 47.9	30455	
			96.59	4 40.1	48 36.2	30572	B
			1913.21	5 12.3	48 35.7	30841	A
			22.91	5 30.5	48 25.5	30892	A
			32.34	5 40.6	48 31.6	30912	A
宮 Miyagawa 川	34 30.1	136 40.5	1913.18	5 04.5	47 59.8	30607	A
			23.02	5 20.9	47 53.3	30625	A
			32.36	5 27.8	47 55.8	30702	A
廣 Hirosima, 1 島	34 23.0	132 27.0	1887.57	4 27.1	48 39.6	30714	
			96.50	4 33.5	48 25.5	30956	A
			1913.34	4 59.1	48 17.2	31169	A
			22.92	5 20.1	48 15.4	31162	A
			32.36	5 29.6	48 16.3	31242	A
洲 Sumoto, 1 本	34 20.3	134 53.5	1896.62	4 31.7	48 06.5	30577	B
			1913.08	5 01.2	47 58.9	30879	A
			22.98	5 21.1	47 51.8	30915	A
			33.37	5 29.4	47 55.1	30964	A
山 Yamaguti 口	34 10.6	131 28.7	1896.52	4 31.7	48 19.2	31065	B
			1913.30	4 56.0	48 06.7	31302	A
			23.12	5 15.7	48 10.0	31304	A
			33.51	5 23.8	48 09.8	31383	A
南 Minabe 部	33 45.8	135 19.4	1887.55	4 30.1	47 46.3	30494	
			96.62	4 16.4	47 23.1	30766	B
			1913.21	4 49.5	47 12.1	31030	A
			22.99	5 09.1	47 05.0	31030	A
			33.36	5 17.8	47 08.9	31107	A
勝 Katuura 浦	33 37.8	135 56.7	1913.20	4 45.8	46 58.2	30971	A
			23.01	5 04.4	46 52.4	31017	A
			32.37	5 14.5	46 56.8	31059	A

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Sikoku (四 國)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
德 Tokusima 島	34 03.8	134 34.6	1887.52	4 26.0	48 00.4	30603	
			96.62	4 30.2	47 47.5	30829	B
			1913.09	4 55.9	47 38.7	30999	A
			22.97	5 15.9	47 30.1	31017	A
			32.59	5 25.0	47 38.6	31075	B
今 Imabari 治	34 03.7	133 00.9	1896.74	4 33.2	48 00.5	30960	C
			1913.18	4 56.8	47 54.1	31141	A
			22.93	5 19.1	47 48.3	31165	A
			33.39	5 24.3	47 51.0	31218	A
須 Susaki 崎	33 23.1	133 17.2	1896.67	4 20.8	47 14.4	31096	A
			1913.12	4 44.2	47 02.2	31289	A
			22.95	5 04.4	46 54.3	31340	A
			32.38	5 15.9	46 59.1	31408	A

Kyûsyû (九 州)

巖 Izuhara, 1 原	34 12.2	129 17.5	1913.26	5 03.8	48 33.5	31360	A
			22.94	5 21.5	48 40.2	31373	A
			33.44	5 30.2	48 35.0	31484	A
中 Nakatu 津	33 36.2	131 11.3	1887.65	4 22.6	48 02.0	31000	
			96.64	4 26.3	47 53.6	31182	A
			1913.24	4 52.4	47 33.1	31488	A
			23.11	5 09.4	47 37.0	31473	A
			32.58	5 16.8	47 34.5	31590	A
唐 Karatu 津	33 27.1	129 58.2	1896.66	4 17.4	47 47.8	31336	A
			1912.66	4 39.4	47 35.3	31580	A
			22.95	5 01.3	47 33.0	31575	A
			32.66	5 10.9	47 30.2	31933	B
佐 Sasebo 世保	33 09.9	129 42.6	1896.60	4 09.2	47 24.8	31506	A
			32.65	4 53.4	46 53.2	31972	C
佐 Saeki 伯	32 57.0	131 53.9	1896.71	4 08.5	46 54.3	31337	B
			1913.10	4 32.4	46 47.1	31537	A
			23.10	4 49.9	46 47.8	31570	A
			32.39	5 15.0	46 46.1	31672	B
宮 Miyazi 地	32 56.2	131 07.3	1896.62	3 50.7	46 59.2	31523	A
			1913.22	4 14.5	46 43.8	31782	A
			22.98	4 34.2	46 52.2	31624	B
			33.41	4 37.2	46 48.1	31725	B
島 Simabara 原	32 47.3	130 22.2	1896.59	4 05.6	46 50.5	31427	A
			1913.21	4 28.8	46 33.2	31704	A
			22.97	4 45.4	46 34.8	31726	A
			33.43	4 51.2	46 30.5	31849	A

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Kyûsyû (九 州)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
富 Tomie, 1 江	32 36.9	128 45.9	1912.70	.....	46 18.0	32193	A
			32.62	4 25.7	46 02.3	32007	A
宮 Miyazaki, 1 崎	31 55.4	131 25.2	1887.67	3 58.4	45 51.3	31562	
			96.52	3 57.6	45 37.2	31773	A
			1913.12	4 18.5	45 22.2	32106	A
			23.09	4 32.0	45 23.8	32122	A
			32.40	4 44.0	45 19.9	32191	A
枕 Makurazaki 崎	31 15.9	130 17.5	1896.55	3 42.4	45 09.3	32002	B
			1912.95	3 47.5	44 50.8	32167	A
			23.02	3 54.5	44 49.4	32232	A
			32.42	4 13.2	44 45.0	32339	A
西 Nisino-omote ノ表	30 44.2	130 59.6	1913.17	3 51.0	43 42.8	32548	A
			23.03	4 08.6	43 42.7	32571	A
			32.43	4 17.9	43 37.0	32650	A
名 Nase, 2 瀬	28 22.1	129 30.1	1912.93	3 07.8	40 30.5	33472	A
			23.05	3 24.3	40 29.4	33528	A
			32.44	3 31.0	40 22.4	33628	B

Manchoukuo (滿 洲 國)

營 Eikô 口	40 40.4	122 16.5	1907.	.....	.....	.....	
			1916.56	5 27.6	57 49.9	28258	A
			22.76	5 44.4	57 49.7	28180	A
			32.57	5 56.4	57 55.6	28266	B
普 Huranten 蘭 店	39 23.8	121 57.3	1922.90	5 25.2	56 15.2	28900	A
			32.55	5 29.3	56 23.6	28956	B
周 Syûsuisi 水 子	38 57.2	121 33.0	1922.91	5 14.9	55 40.7	29294	A
			32.56	5 28.8	55 46.2	29347	A

Tyôsen (朝 鮮)

雄 Yûki, 1 基	42 20.1	130 25.4	1912.74	7 09.6	58 01.2	27658	A
			22.64	7 36.2	58 04.4	.....	A
			32.48	7 41.4	58 03.9	27630	B
清 Seisin, 1 津	41 46.5	129 48.1	1912.72	4 41.3	58 18.0	27731	A
			33.50	5 51.6	58 06.2	27632	B
城 Zyôsin, 1 津	40 39.9	129 11.8	1912.76	6 38.5	56 32.3	28502	A
			22.63	7 03.7	56 41.0	28364	C
			33.49	7 04.3	56 31.0	28459	B
北 Hokusei 青	40 14.0	128 18.4	1912.77	6 23.3	56 06.6	28705	A
			22.61	6 47.8	56 10.8	28618	A
			32.46	7 02.2	56 13.3	28683	A

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Tyôsen (朝 鮮)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
Gisyû 義 州	40 12.6	124 32.3	1912.60	5 46.1	56 48.0	28439	A
			22.56	6 09.6	56 55.4	28448	A
			32.53	6 27.1	56 50.7	28507	B
Kisen 熙 川	40 09.9	126 16.3	1912.64	6 08.3	56 18.7	28721	A
			22.53	6 33.1	56 26.3	28649	A
			32.53	6 48.3	56 25.3	28680	B
Genzan, 1 元 山	39 09.9	127 25.7	1912.69	6 04.8	55 00.0	29241	A
			22.59	6 28.5	55 01.8	29200	C
			33.47	6 41.7	55 00.8	29238	B
Heizyô, 2 平 壤	39 00.3	125 43.5	1912.54	5 42.3	55 00.5	29355	A
			22.52	6 00.9	55 07.6	29349	A
			32.50	6 20.2	55 11.2	29334	B
Mukinho 夢 金 浦	38 10.9	124 47.0	1912.55	5 20.0	54 11.5	29758	A
			22.50	5 38.2	54 15.3	29736	A
			32.49	5 56.9	54 14.4	29791	A
Tyûmonsin 注 文 津	37 53.4	128 49.8	1912.83	5 47.0	53 21.5	29795	A
			22.67	6 10.2	53 15.4	29755	A
			32.45	6 24.5	53 13.0	29875	A
Zinsen 仁 川	37 28.5	126 37.6	1912.50	5 28.4	53 10.3	30036	A
			22.46	5 39.4	53 08.8	30036	A
			32.44	6 03.5	53 12.5	30048	A
Gôsen 鰲 川	36 26.1	126 31.2	1912.48	5 09.5	51 46.7	30537	A
			22.85	5 35.4	51 49.8	30540	A
			32.43	5 43.6	51 52.6	30603	A
Kôkan 黃 澗	36 13.4	127 54.5	1912.39	5 13.3	51 20.2	30620	A
			22.64	5 29.4	51 20.3	30573	A
			33.46	5 48.5	51 19.5	30661	A
Hokô 浦 項	36 02.8	129 22.6	1912.88	5 17.6	51 05.2	30473	A
			22.71	5 40.9	51 01.3	30482	C
			33.45	5 52.3	50 57.3	30563	C
Sinsyû 晋 州	35 11.2	128 05.5	1912.64	4 46.6	50 11.9	31002	A
			22.92	5 06.3	50 04.1	30994	A
			32.37	5 19.3	50 08.6	31070	B
Moppo, 2 木 浦	34 46.7	126 23.5	1912.44	4 25.1	49 42.9	31302	A
			22.88	4 50.2	49 42.6	31324	A
			28.59	4 59.6	49 44.5	31283	A
			32.39	4 59.8	49 52.3	31403	A
Kôkô 高 興	34 36.3	127 17.1	1912.37	4 42.5	49 30.7	31116	A
			22.90	4 54.7	49 51.0	31019	A
			32.39	5 08.3	49 50.9	31133	A
Kwan Tô 莞 島	34 18.5	126 45.7	1912.37	3 58.8	49 07.1	31946	A
			30.65	4 54.3	48 56.9	31523	A
Saisyû, 2 濟 州	33 30.7	126 31.5	1912.39	4 25.2	48 01.2	31921	A
			32.40	4 24.7	47 58.0	31939	B

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Izu Syotô (伊 豆 諸 島)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
Senzu, Ô Sima 大 島 泉 津	34 46.6	139 24.7	1913.08	6 07.0	49 38.4	29942	A
			33.12	6 40.9	49 00.1	29523	B
Motomura, Ô Sima 大 島 元 村	34 45.0	139 21.5	1913.09	4 43.3	50 50.0	29937	A
			33.12	4 01.6	49 30.1	31339	B
Mabusi, Ô Sima 大 島 間 伏	34 41.4	139 23.3	1913.09	4 06.9	47 11.4	31117	A
			33.11	4 42.7	47 08.5	31171	B
Habu, Ô Sima 大 島 波 浮	34 41.0	139 26.6	1913.10	6 31.7	48 32.8	30933	A
			33.11	7 11.4	48 37.7	30898	B

Ogasawara Guntô (小 笠 原 群 島)

Okumura, Titi Sima 父 島 奥 村	27 05.8	142 12.1	1913.44	2 20.2	37 10.8	31978	A
			22.47	2 39.8	36 54.1	32025	B
			33.03	2 43.7	36 57.8	32124	A
Ômura, Titi Sima, 2 父 島 大 村	27 05.3	142 11.2	1913.42	2 25.2	37 45.1	31814	A
			22.47	2 39.9	37 28.2	31944	A
			33.03	2 42.4	37 34.0	32080	B
Ôgiura, Titi Sima 父 島 扇 浦	27 04.2	142 12.0	1913.43	2 25.7	37 26.2	32098	A
			22.48	3 04.2	37 27.7	32220	B
			33.04	3 14.1	37 39.2	32335	B
Kitamura, Haha Sima 母 島 北 村	26 41.5	142 08.4	1913.42	2 21.6	36 59.6	31830	A
			22.49	2 35.4	36 53.7	31818	B
			33.06	2 39.7	36 56.4	31882	A
Higasi Minato, Haha Sima 母 島 東 港	26 41.4	142 08.5	1913.41	2 20.7	37 44.0	31781	A
			22.50	2 37.4	37 06.8	32165	B
			33.07	2 40.8	37 05.9	32269	A
Okimura, Haha Sima 母 島 冲 村	26 38.1	142 09.4	1913.40	1 59.0	37 00.8	32327	A
			22.50	2 16.9	36 54.6	32361	A
			33.09	2 22.6	36 53.5	32466	A
Minami Saki, Haha Sima 母 島 南 崎	26 36.3	142 10.3	1913.40	2 02.3	37 23.8	32157	A
			22.50	2 21.8	37 12.9	32190	A
			33.07	2 28.0	37 13.6	32293	A

Nansei Syotô (南 西 諸 島)

Naha, 1 那 覇	26 12.6	127 40.1	1882.64	2 25.5	38 19.	3354	
			1912.78	2 20.2	37 10.9	34454	A
			23.07	2 27.5	37 10.9	34563	A
			32.46	2 51.3	36 56.9	34748	B
Miyako 宮 古	24 48.5	125 16.9	1912.83	1 50.2	35 03.5	35188	A
			23.11	2 03.8	35 00.4	35253	A
			32.48	2 10.3	34 54.6	35383	A

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Nansei Syotô (南西諸島)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
Isigaki 石垣	24 19.9	124 09.9	1912.82	1 40.1	34 20.1	35495	A
			23.13	1 55.2	34 11.2	35594	B
			32.50	1 59.4	34 08.9	35713	C

Taiwan (臺灣)

Taihoku 臺北	25 02.4	121 30.4	1922.94	1 59.5	35 25.5	35806	A
			32.60	2 08.7	35 17.8	35954	C
Karenkô 花蓮港	23 58.7	121 36.4	1913.25	1 09.8	33 49.5	35826	A
			23.02	1 22.1	33 41.0	35979	A
			32.54	1 26.0	33 39.6	36073	A
Hôko Tô, 1 澎湖島	23 34.3	119 33.8	1913.20	0 40.7	32 56.7	36305	A
			22.99	0 53.9	32 45.6	36370	A
			32.58	1 01.6	32 48.3	36298	A
Toapanrâ 大板埒	21 57.7	120 45.3	1913.21	0 43.8	30 09.1	36650	A
			23.04	0 57.3	29 59.3	36754	A
			32.55	1 03.1	29 51.2	36915	A

Mariana Syotô (Mariana Islands) (マリアナ諸島)

Pagan Tô, 2 パガン島	18 07.6	145 46.0	1916.50	−0 51.0	.....	.....	A
			23.32	−0 41.5	22 31.9	33372	A
			32.71	−0 30.8	22 40.4	33434	A
Saipan Tô, 2 サイパン島	15 13.1	145 43.3	1915.50	−1 53.5	.....	.....	A
			23.33	−1 49.5	17 28.3	34385	A
			32.65	−1 47.9	17 17.0	34460	A
Saipan Tô, 3 サイパン島	15 09.3	145 44.9	1923.34	−1 35.5	17 25.9	34373	A
			32.75	−1 41.0	17 12.7	34469	A

Nisi-Karorin Syotô (West Caroline Islands) (西カロリン諸島)

Yappu Tô ヤップ島	9 31.4	138 8.5	1917.50	−1 53.0	.....	.....	A
			23.40	−1 53.9	5 45.0	36740	A
			33.42	−1 52.6	5 35.4	36809	A
Korôru Tô, Parao Syotô, 2 パラオ諸島コロール島	7 20.0	134 29.0	1923.36	−2 10.1	1 30.1	37448	A
			33.35	−2 07.9	1 11.0	37487	A
Marakaru Tô, Parao Syotô パラオ諸島マラカル島	7 19.9	134 27.7	1918.50	−2 30.0	.....	.....	A
			23.38	−2 19.1	1 20.9	37361	A
			33.36	−2 20.9	0 59.8	37511	A

Table 41.—RESULTS OF OBSERVATIONS AT REPEATED STATIONS—Continued.

Higasi-Karorin Syotô (East Caroline Islands) (東カロリン諸島)

Station	Latitude	Longitude	Date	Declination	Dip	Horizontal Intensity	Remark
	° ′	° ′		° ′	° ′	γ	
Orôru Tô オロール島	8 35.0	149 39.5	1916.50	−4 06.0	.....	.....	A
			23.43	−3 57.7	5 36.3	35234	A
			33.52	−3 56.1	5 21.6	35242	A
Matu Sima, Torakku Syotô トラック諸島松島	7 22.6	151 53.7	1923.45	−5 32.8	0 47.6	33843	A
			33.60	−5 22.6	0 51.7	33982	A
Take Sima, Torakku Syotô トラック諸島竹島	7 21.4	151 53.3	1917.50	−3 38.0	.....	.....	A
			23.44	−3 32.7	2 05.1	35668	A
			33.52	−3 33.0	1 57.0	35836	A
Mereyon Tô メレヨン島	7 22.3	143 54.3	1915.50	−3 04.6	.....	.....	A
			23.42	−3 01.2	2 02.6	36191	A
			33.50	−3 00.0	1 43.2	36285	A
Ponape Tô, 7 ポナペ島	6 47.9	158 09.4	1918.50	−5 56.7	.....	.....	A
			23.48	−5 58.6	2 45.2	34959	A
			32.60	−6 00.2	2 27.6	34929	A
Rôsoppu Tô ローソップ島	6 53.6	152 44.1	1923.47	−4 35.5	1 39.2	34995	A
			33.57	−4 40.4	1 20.8	35033	A
Kusai Tô クサイ島	5 20.2	163 01.2	1920.50	−6 23.4	.....	.....	A
			23.50	−6 23.9	2 31.9	34207	A
			32.40	−6 50.1	2 02.1	34087	A
Satôwan Tô サトウワン島	5 20.1	153 44.1	1916.50	−5 16.0	.....	.....	A
			22.47	−5 08.4	−0 40.0	35500	A
			33.62	−5 10.3	−0 53.4	35525	A

Mâsyaru Syotô (Marshall Islands) (マーシャル諸島)

Eniwetakku Tô エニウェタック島	11 20.6	162 20.5	1917.50	−6 20.0	.....	.....	A
			23.55	−6 19.3	12 08.8	33154	A
			32.37	−6 17.2	12 03.0	33129	A
Rongorappu Tô ロンゴラップ島	11 08.9	166 53.6	1917.50	−7 18.0	.....	.....	A
			23.53	−7 23.5	13 31.0	32333	A
			32.58	−7 25.9	13 18.8	32290	A
Yarûto Tô ヤルート島	5 54.9	169 39.1	1915.50	−7 57.6	.....	.....	A
			23.52	−8 03.8	4 43.7	34092	A
			32.43	−8 10.7	4 35.8	34126	A

Table 42.

AVERAGE VALUES OF THE MAGNETIC ELEMENTS AT EACH POSITION IN THE WESTERN NORTH PACIFIC OCEAN, DEDUCED FROM THE RESULTS OF THE OCEAN MAGNETIC OBSERVATIONS MADE BY THE CARNEGIE INSTITUTION.

No.	Declination				Dip and Horizontal Intensity				
	Lat. N.	Long. E.	Date	Dec.	Lat. N.	Long. E.	Date	Dip	Hor. (C.G.S.)
	°	°		° ′	°	°		° ′	
1.	47.00	166.00	1906.72 1916.15 1929.52	−2 04 −1 12 −1 04	46.50	166.00	1906.72 1916.15 1929.52	58 12 58 22 58 13	0.2471 .2462 .2461
2.	46.00	164.00	1906.72 1916.15 1929.52	−1 20 −0 27 −0 01	46.00	164.50	1906.72 1916.15 1929.52	57 51 57 56 57 39	0.2492 .2487 .2481
3.	46.00	161.00	1906.72 1916.65 1929.52	−0 01 1 03 1 16	45.00	160.00	1906.72 1916.64 1929.52	56 51 56 53 56 51	0.2561 .2550 .2529
4.	39.00	149.50	1906.70 1916.64 1929.50	3 13 4 19 4 33	37.00	150.50	1906.70 1916.63 1929.50	48 54 49 19 49 04	0.2871 .2835 .2857
5.	30.50	144.00	1907.03 1912.31 1916.62 1929.42	2 35 2 39 2 54 3 17	30.50	144.00	1907.03 1912.31 1916.62 1929.42	42 03 42 06 41 42 41 40	0.3108 .3093 .3108 .3125
6.	25.50	144.50	1906.58 1916.62 1929.41	0 54 1 17 1 26	25.00	144.50	1906.58 1916.62 1929.41	33 46 33 50 33 37	0.3248 .3236 .3250
7.	19.00	166.50	1916.11 1929.36	−6 46 −6 52	19.00	166.50	1916.11 1929.36	26 24 26 09	0.3110 .3074
8.	17.50	144.00	1906.57 1916.61 1929.40	−1 21 −0 48 −0 42	17.50	144.00	1906.57 1916.61 1929.41	21 33 21 26 21 04	0.3436 .3423 .3439
9.	15.00	174.50	1907.78 1912.34 1916.50 1929.35	−9 00 −8 41 −8 51 −8 59	15.00	174.50	1907.78 1912.34 1916.50 1929.35	23 13 23 19 23 07 22 19	0.3143 .3151 .3132 .3151
10.	14.00	145.00	1906.55 1916.56 1929.39	−2 23 −1 51 −1 43	14.50	146.00	1906.54 1916.55 1929.39	15 57 16 22 15 48	0.3466 .3441 .3466
11.	11.00	179.00	1912.35 1916.50 1929.34	−9 15 −8 51 −9 27	10.00	180.00	1912.35 1916.49 1929.34	16 38 16 17 15 48	0.3307 .3253 .3239

Table 43.

AVERAGE VALUES OF THE MAGNETIC ELEMENTS IN EACH REGION IN JAPAN, DEDUCED FROM THE DATA AT REPEATED STATIONS IN IT.

No.	Region	Latitude N.	Longitude E.	Date	Declination	Dip	Horizontal Intensity
		°	°		° ′	° ′	γ
I	Karahuto	48.370	142.373	1912.67 22.49 32.69	8 11.2 8 48.2 9 12.7	62 04.2 62 06.4 62 11.8	24435 24358 24304
II	Tisima Rettô	46.682	150.737	1916.63 33.43	4 38.3 5 27.8	…… ……	…… ……
		44.370	146.856	1916.14 33.10	…… ……	57 41.4 57 23.9	26092 26262
III	Hokkaidô	43.143	142.031	1894.63 1912.66 22.61 32.89	5 52.8 6 46.2 7 20.1 7 35.9	56 58.9 56 53.7 56 58.8 56 58.2	26731 26943 26883 26883
IV	Northern part of Tyôsen	40.056	127.805	1912.72 22.59 32.99	6 18.7 6 43.3 6 54.2	55 59.4 56 05.0 56 02.8	28792 28708 28764
V	Northern part of Honsyû	38.872	140.306	1895.59 1912.76 22.69 33.09	5 07.6 5 52.0 6 14.6 6 27.0	…… …… …… ……	…… …… …… ……
		39.043	140.475	1895.54 1912.78 22.66 33.13	…… …… …… ……	52 49.7 52 44.9 52 43.2 52 46.6	28471 28693 28673 28683
VI	Southern part of Tyôsen	36.288	127.780	1912.66 22.78 32.68	5 09.8 5 34.2 5 45.1	…… …… ……	…… …… ……
		37.138	127.378	1912.69 22.68 32.71	…… …… ……	52 36.2 52 35.5 52 34.3	30141 30128 30208
VII	Middle part of Honsyû	35.788	137.171	1912.91 22.86 33.17	5 23.1 5 43.7 5 52.0	49 27.5 49 22.6 49 26.5	30100 30092 30142
VIII	South-Western part of Honsyû and Sikoku	34.473	133.791	1896.60 1913.14 22.94 32.93	4 37.5 5 04.7 5 25.2 5 35.0	48 26.8 48 18.8 48 14.5 48 17.3	30672 30912 30934 30987
IX	Kyûsyû	32.806	130.622	1913.13 23.01 32.91	4 29.8 4 47.5 4 55.5	…… …… ……	…… …… ……
		32.702	130.894	1896.61 1913.07 23.03 32.76	…… …… …… ……	46 44.6 46 29.4 46 31.1 46 27.8	31511 31766 31760 31900

Table 43.

AVERAGE VALUES OF THE MAGNETIC ELEMENTS IN EACH REGION IN JAPAN, DEDUCED FROM THE DATA AT REPEATED STATIONS IN ITI—Continued.

No.	Region	Latitude N.	Longitude E.	Date	Declination	Dip	Horizontal Intensity
		°	°		° ′	° ′	γ
		28.368	129.502	1912.93	3 07.8	.....	 7
				23.05	3 24.3	.....	.....
X	Nansei Syotô			32.44	3 31.0	.....	.....
		27.289	128.585	1912.86	.....	38 50.7	33963
				23.06	.....	38 50.2	34046
				32.45	.....	38 39.7	34188
		26.840	142.171	1913.42	2 16.4	.....	.....
				22.49	2 36.5	.....	.....
XI	Ogasawara Guntô			33.06	2 41.6	.....	.....
		26.864	142.176	1913.42	.....	37 17.7	32034
				22.48	.....	37 08.5	32093
				33.05	.....	37 12.4	32197
		23.171	120.642	1913.22	0 51.4	32 18.4	.....
				23.02	1 04.4	32 08.6	.....
XII	Taiwan			32.56	1 10.2	32 06.4	.....
		22.970	121.181	1913.23	.....	.....	36238
				23.03	.....	.....	36367
				32.55	.....	.....	36494
		16.673	145.745	1916.00	−1 22.3	.....	.....
				23.33	−1 15.5	.....	.....
XIII	Mariana Syotô			32.68	−1 09.4	.....	.....
		16.167	145.746	1923.33	.....	19 08.7	34043
				32.70	.....	19 03.4	34121
		9.469	166.296	1916.83	−7 11.9	.....	.....
				23.53	−7 15.5	.....	.....
XIV	Mâsyaru Syotô			32.46	−7 17.9	.....	.....
		9.276	164.085	1923.53	.....	9 23.9	33231
				32.45	.....	9 08.0	33169
		8.428	136.302	1918.00	−2 11.5	.....	.....
				23.39	−2 06.5	.....	.....
XV	Nisi-Karorin Syotô			33.39	−2 06.7	.....	.....
		8.063	135.695	1923.38	.....	2 52.0	37183
				33.38	.....	2 35.4	37269
		7.528	150.902	1917.00	−4 11.3	.....	.....
				23.44	−4 07.6	.....	.....
				33.29	−4 07.3	.....	.....
XVI	Higasi-Karorin Syotô	7.401	151.269	1923.45	.....	2 49.7	35409
				33.34	.....	2 34.0	35465

Table 44.

VALUES OF A, B AND C OF THE EMPIRICAL FORMULA $M_t = A + B(t-1933.0) + C(t-1933.0)^2$ FOR EACH REGION IN JAPAN, DEDUCED FROM THE DATA IN TABLE 43.

No.	Region	Declination			Dip			Horizontal Intensity		
		A	B	C	A	B	C	A	B	C
		° ′	′	′	° ′	′	′	γ	γ	γ
I	Karahuto	9 13.2	1.66	−0.068	62 12.0	0.69	0.015	24303	− 4.0	0.12
II	Tisima Rettô	5 26.5	2.95	.....	57 24.0	−1.03	.....	26261	10.0	.....
III	Hokkaidô	7 36.0*	0.57*	−0.093*	56 58.2*	−0.35*	−0.028*	26883*	3.0*	0.30*
		7 37.8†	1.92†	−0.022†	56 59.2†	0.35†	0.009†	26869†	− 8.4†	−0.31†
IV	Northern part of Tyôsen	6 54.2	0.31	−0.071	56 02.8	−0.61	−0.039	28764	12.6	0.69
V	Northern part of Honsyû	6 26.9*	0.65*	−0.053*	52 46.5*	0.57*	0.024*	28683*	2.4*	0.15*
		6 27.6†	1.17†	−0.026†	52 46.3†	0.33†	0.011†	28597†	−10.3†	−0.30†
VI	Southern part of Tyôsen...	5 45.2	0.41	−0.065	52 34.3	−0.15	−0.003	30212	13.0	0.47
VII	Middle part of Honsyû	5 52.0	0.18	−0.062	49 26.4	0.81	0.043	30141	7.6	0.28
VIII	South-Western part of Honsyû and Sikoku	5 35.0*	0.41*	−0.056*	48 17.3*	0.65*	0.036*	30988*	6.9*	0.15*
		5 36.2†	1.29†	−0.009†	48 16.8†	0.24†	0.014†	30973†	− 0.4†	−0.24†
IX	Kyûsyû...	4 55.5*	0.31*	−0.050*	46 27.7*	−0.60*	−0.026*	31906*	23.2*	0.81*
		.....	.....	.....	46 29.0†	0.22†	0.018†	31882†	5.4†	−0.13†
X	Nansei Syotô	3 31.1	0.22	−0.047	38 38.8	−1.69	−0.055	34198	18.9	0.36
XI	Ogasawara Guntô	2 41.6	−0.44	−0.088	37 12.3	1.11	0.071	32196	11.5	0.16
XII	Taiwan...	1 10.3	0.22	−0.037	32 06.5	0.18	0.040	36500	13.4	0.01
XIII	Mariana Syotô	−1 09.2	0.49	−0.017	19 03.2	−0.57	.....	34124	8.3	.....
XIV	Mâsyaru Syotô	−7 18.0	−0.10	0.017	9 07.0	−1.78	.....	33165	−7.0	.....
XV	Nisi-Karorin Syotô	−2 06.5	−0.59	−0.062	2 36.0	−1.66	.....	37266	8.6	.....
XVI	Higasi-Karorin Syotô	−4 07.2	−0.31	−0.035	2 34.5	−1.59	.....	35463	5.7	.....

* is derived with data obtained by three recent magnetic surveys.
† " " " " " " four " " " .

Table 45.

VALUES OF A, B AND C OF THE EMPIRICAL FORMULA $M_t = A + B(t-1933.0) + C(t-1933.0)^2$ FOR EACH OBSERVATORY, DEDUCED FROM THE DATA IN TABLE 37.

Observatory	Declination			Dip			Horizontal Intensity		
	A	B	C	A	B	C	A	B	C
	° ′	′	′	° ′	′	′	γ	γ	γ
Sitka	−30 10.2	2.93	0.120	74 24.8	0.72	0.046	15551	14.3	0.92
Ôtomari	8 39.4	1.13	−0.085	.....	.....	.....	.....	.....	.....
Zinsen	6 04.2	0.32	−0.089	53 12.8	0.83	0.071	29950	4.8	05.3
Kakioka	5 45.2	1.08	−0.037	49 27.9	0.09	0.014	29725	5.4	0.40
Tsingtau	4 34.5	1.21	−0.036	52 05.5	−0.39	−0.017	30917	19.4	0.90
Tucson	−13 54.0	−3.37	−0.292	59 39.9	1.54	0.043	26339	−43.9	0.13
Lukiapang	3 40.1	0.93	−0.038	45 22.2	−0.89	−0.018	33320	19.2	0.71
Taihoku	2 10.0	0.18	−0.066	.....	.....	.....	.....	.....	.....
Hongkong	0 36.3	0.55	−0.049	30 31.5	−1.27	−0.003	37377	25.9	0.74
Honolulu	−10 06.4	−0.25	0.064	39 20.2	−4.23	−0.452	28489	−25.9	0.24
Teoloyucan	− 9 29.9	−1.84	0.000	47 04.8	4.85	0.110	31039	−84.0	−4.21
Antipolo	− 0 26.9	−0.23	−0.076	15 46.0	−0.53	0.121	38330	27.8	0.85
Parao	− 2 04.6	−2.08	−0.227	.....	.....	.....	.....	.....	.....
Buitenzorg	− 0 59.6	−1.45	−0.040	−32 22.1	−1.27	0.084	36867	6.4	−0.16
Apia	−10 37.6	−0.89	0.134	−30 04.3	1.42	0.123	35170	− 9.0	−0.05
Watheroo	4 04.4	−2.26	−0.058	−64 47.0	−12.89	−1.042	24625	1.4	1.81
Toolangi	− 8 31.5	−4.75	−0.263	−67 52.1	0.00	0.130	22886	11.0	2.50
Christchurch	−18 03.1	−6.39	−0.117	−68 20.2	−0.51	0.029	22081	− 7.7	0.54

Table 46.—VALUES OF A, B AND C OF THE EMPIRICAL FORMULA $M_t = A + B(t-1933.0) + C(t-1933.0)^2$ FOR EACH STATION IN JAPAN.

No.	Station	Declination			Dip			Horizontal Intensity		
		A	B	C	A	B	C	A	B	C
		° ′	′	′	° ′	′	′	γ	γ	γ
16	Sikuka, 2	9 09.3	1.07	−0.104	62 59.2	0.67	0.013	23797	− 7.9	−0.11
17	Usiro	9 22.7	2.30	−0.034	62 42.1	0.87	0.021	24045	− 5.5	0.07
19	Maoka, 1	9 07.6	1.64	−0.065	60 54.7	0.53	0.012	25065	0.3	0.31
30	Wakkanai	8 42.7	1.55	−0.059	59 21.8	0.39	0.010	25931	− 3.8	−0.09
32	Monbentu	7 48.8	0.83	−0.080	58 00.2	−0.05	−0.017	26305	− 7.3	−0.14
33	Rumoi	8 16.2	4.55	0.113	57 39.6	−3.64	−0.191	26753	31.8	1.62
35	Sapporo, 1	7 56.5	2.42	−0.018	56 51.7	−1.93	−0.073	26899	21.1	0.86
37	Siranuka	6 47.6	0.88	−0.078	56 40.0	−0.08	−0.022	26804	− 7.5	−0.16
38	Saruhuto	7 39.1	1.85	−0.027	56 32.1	−1.23	−0.077	27054	14.6	0.86
39	Setana	7 36.8	−0.78	−0.139	56 18.3	−0.35	−0.020	27488	12.8	0.74
40	Biro-o	6 58.3	0.22	−0.103	55 49.2	0.34	0.012	27252	2.5	0.27
41	Mori	7 16.8	−2.58	−0.242	56 13.0	0.21	−0.037	27321	−10.7	−0.22
43	Nohezi	7 30.3	3.19	0.038	54 48.8	1.66	0.053	27837	− 1.9	0.16
44	Azigasawa	7 02.3	1.12	−0.042	54 50.5	0.41	0.012	27962	4.2	0.34
45	Kuzi	6 30.9	0.95	−0.055	54 02.7	−0.35	−0.023	28264	6.8	0.38
47	Akita, 2	6 49.5	1.55	−0.019	53 30.0	−0.43	−0.013	28534	2.9	0.15
48	Sakata	6 38.2	0.57	−0.071	52 42.6	−0.15	−0.012	28813	− 0.3	0.00
50	Sendai, 1	6 44.7	4.84	0.118	52 00.9	1.40	0.045	28788	4.9	0.40
56	Nigata, 2	6 36.3	1.57	−0.018	51 53.9	1.70	0.067	29038	−16.6	−0.68
57	Wazima, 1	6 29.9	1.82	−0.006	51 21.9	1.27	0.064	29636	9.1	0.37
59	Itoigawa	6 17.7	0.48	−0.056	50 53.0	0.15	0.014	29512	3.7	0.15
60	Ueda	5 46.3	0.31	−0.070	50 20.7	1.03	0.051	29429	3.5	0.05
61	Sioya	6 06.1	−1.55	−0.142	50 17.1	−0.65	−0.038	29994	8.1	0.28
65	Tyôsi, 2	5 04.2	−2.02	−0.121	48 23.2	0.32	0.065	30223	18.2	0.23
66	Iida, 1	5 41.6	0.22	−0.075	48 57.6	1.45	0.083	30149	4.3	0.17
68	Obama	5 58.9	1.05	−0.033	49 13.0	0.86	0.080	30493	7.7	0.20
69	Tottori	6 04.5	0.33	−0.063	49 34.7	0.08	0.012	30558	7.4	0.15
70	Imaiti	5 56.2	1.05	−0.040	49 53.0	0.16	−0.001	30492	− 4.6	−0.27
72	Tomida	5 40.7	0.28	−0.049	48 34.6	1.23	0.061	30488	4.8	0.12
73	Kakegawa	5 21.6	−0.03	−0.054	48 05.0	1.68	0.082	30500	11.4	0.40
74	Okayama, 1	5 41.1	0.67	−0.037	48 32.6	1.60	0.089	30912	0.0	−0.20
76	Miyagawa	5 28.0	0.23	−0.048	47 56.3	0.78	0.048	30709	11.4	0.30
77	Hirosima, 1	5 29.9	0.34	−0.062	48 16.5	0.26	0.015	31250	13.3	0.45
79	Sumoto, 1	5 29.3	0.22	−0.060	47 54.8	0.81	0.051	30962	4.9	0.02
81	Yamaguti	5 23.7	0.21	−0.061	48 09.9	−0.19	−0.018	31377	10.8	0.34
82	Minabe	5 17.7	0.28	−0.058	47 08.6	0.91	0.055	31103	10.7	0.34

Table 46.—VALUES OF A, B AND C OF THE EMPIRICAL FORMULA $M_t = A + B(t-1933.0) + C(t-1933.0)^2$ FOR EACH STATION IN JAPAN—Continued.

No.	Station	Declination			Dip			Horizontal Intensity		
		A	B	C	A	B	C	A	B	C
		° ′	′	′	° ′	′	′	γ	γ	γ
83	Katuura	5 14.9	0.62	−0.043	46 57.4	1.05	0.055	31062	4.1	−0.04
85	Tokusima	5 25.2	0.37	−0.055	47 39.3	1.82	0.090	31078	7.9	0.18
86	Imabari	5 24.5	−0.37	−0.089	47 50.7	0.67	0.042	31216	6.0	0.10
87	Susaki	5 16.4	0.76	−0.043	46 59.8	1.24	0.068	31413	8.0	0.07
88	Izuhara, 1	5 30.1	0.35	−0.050	48 35.5	−1.06	−0.059	31479	11.0	0.43
90	Nakatu	5 16.9	0.28	−0.049	47 34.2	−0.62	−0.034	31598	19.5	0.69
91	Karatu	5 11.1	0.40	−0.057	47 30.1	−0.32	−0.003	31951	54.6	1.80
93	Saeki	5 16.9	3.22	0.049	46 45.9	−0.32	−0.013	31681	14.9	0.37
94	Miyazi	4 37.4	−0.54	−0.086	46 48.5	−0.99	−0.062	31716	21.7	1.25
97	Simabara	4 51.2	0.01	−0.057	46 30.8	−0.68	−0.028	31842	16.0	0.44
100	Miyazaki, 1	4 44.8	1.26	−0.003	45 19.4	−0.73	−0.030	32197	10.3	0.27
103	Makurazaki	4 14.7	2.69	0.066	44 44.6	−0.65	−0.017	32347	13.7	0.22
104	Nisino-omate	4 18.2	0.56	−0.041	43 36.5	−0.93	−0.031	32656	11.4	0.28
106	Nase, 2	3 31.1	0.22	−0.047	40 21.8	−1.09	−0.033	33635	13.1	0.23
128	Zyôsin, 1	7 04.9	−1.14	−0.121	56 31.9	−1.78	−0.087	28449	19.3	1.07
130	Hokusei	7 02.7	0.89	−0.052	56 13.4	0.16	−0.009	28691	14.8	0.75
132	Kisen	6 48.8	0.97	−0.050	56 25.0	−0.58	−0.044	28684	8.5	0.49
134	Genzan, 2	6 41.5	0.67	−0.056	55 01.7	−0.12	−0.010	29231	6.3	0.32
138	Mukinho	5 57.9	1.89	0.002	54 14.2	−0.35	−0.024	29796	9.5	0.36
139	Tyûmonsin	6 25.0	0.96	−0.046	53 13.0	−0.04	0.019	29886	21.0	0.80
141	Gôsen	5 43.6	−0.02	−0.082	51 52.8	0.29	0.000	30608	9.7	0.29
143	Hokô	5 52.1	0.43	−0.064	50 57.5	−0.36	0.001	30558	10.4	0.29
146	Moppo, 2	5 00.0	0.26	−0.070	49 53.3	1.59	0.053	31410	11.3	0.28
147	Kôkô	5 09.3	1.58	0.014	49 50.3	−1.05	−0.097	31147	23.0	1.03
168	Okumura, Titi Sima	2 43.7	−0.60	−0.092	36 57.7	1.53	0.112	32124	11.3	0.18
170	Ômura, 〃 , 2	2 42.4	−0.51	−0.071	37 33.9	1.84	0.123	32080	11.7	−0.11
171	Ôgiura, 〃	3 14.1	−0.83	−0.169	37 39.1	1.58	0.047	32335	9.1	−0.17
173	Kitamura, Haha Sima	2 39.7	−0.19	−0.057	36 56.4	0.74	0.046	31881	9.6	0.34
174	Higasi Minato, 〃	2 40.8	−0.48	−0.077	37 05.8	2.04	0.204	32270	− 7.7	−1.68
176	Okimura, 〃	2 22.6	−0.22	−0.073	36 53.5	0.20	0.029	32465	12.8	0.28
177	Minami Saki, 〃	2 28.0	−0.24	−0.079	37 13.5	0.73	0.064	32292	12.7	0.28
180	Naha, 1	2 53.2	3.51	0.093	36 55.7	−2.29	−0.076	34761	24.2	0.43
185	Karenkô	1 26.0	−0.05	−0.044	33 39.7	0.24	0.037	36076	6.4	−0.33
186	Hôko Tô, 1	1 01.8	0.51	−0.028	32 48.7	1.04	0.073	36292	−15.4	−0.76
189	Toapanrâ	1 03.2	0.20	−0.039	29 50.8	−0.78	0.007	36924	20.1	0.30
193	Pagan Tô, 2	−0 30.5	0.98	−0.016	.....	.....	.....	.....	.....	.....
195	Saipan Tô, 2	−1 47.9	−0.03	−0.020	.....	.....	.....	.....	.....	.....
199	Yappu Tô	−1 52.7	0.30	0.018	.....	.....	.....	.....	.....	.....
203	Marakaru Tô, Parao Syotô	−2 20.3	−1.68	−0.162	.....	.....	.....	.....	.....	.....
206	Orôru Tô	−3 55.9	−0.39	−0.061	.....	.....	.....	.....	.....	.....
210	Take Sima, Torakku Syotô	−3 32.7	−0.55	−0.058	.....	.....	.....	.....	.....	.....
214	Mereyon Tô	−2 59.9	−0.08	−0.020	.....	.....	.....	.....	.....	.....
221	Ponape Tô, 7	−6 00.2	−0.03	0.015	.....	.....	.....	.....	.....	.....
223	Kusai Tô	−6 53.2	−5.30	−0.233	.....	.....	.....	.....	.....	.....
229	Eniwetakku Tô	−6 17.0	0.32	0.008	.....	.....	.....	.....	.....	.....
231	Rongorappu Tô	−7 25.8	0.16	0.043	.....	.....	.....	.....	.....	.....
236	Yarûto Tô	−8 11.1	−0.77	0.000	.....	.....	.....	.....	.....	.....

Table 47.

VALUES OF A, B AND C OF THE EMPIRICAL FORMULA $M_t = A + B(t-1933.0) + C(t-1933.0)^2$ FOR EACH POSITION ON THE SEA, DEDUCED FROM THE DATA IN TABLE 42.

Position		Declination			Dip			Horizontal Intensity		
Latitude	Longitude	A	B	C	A	B	C	A	B	C
°	°	° ′	′	′	° ′	′	′	C.G.S.	γ	γ
47.00 N	166.00 E	− 1 14	− 3.8	−0.22	.....	.....	.....	.....	.....	.....
46.50	166.00	.....	.....	.....	58 06	− 2.2	−0.08	0.2463	8	0.4
46.00	164.50	.....	.....	.....	57 30	− 2.9	−0.08	0.2480	− 4	0.0
46.00	164.00	− 0 04	− 1.4	−0.17	.....	.....	.....	.....	.....	.....
46.00	161.00	1 06	− 3.7	−0.24	.....	.....	.....	.....	.....	.....
45.00	160.00	.....	.....	.....	56 50	− 0.5	−0.02	0.2522	−21	− 0.2
39.00	149.00	4 23	− 3.7	−0.24	.....	.....	.....	.....	.....	.....
37.00	150.50	.....	.....	.....	48 51	− 4.4	−0.16	0.2876	64	2.3
30.50	144.00	3 25	2.2	0.01	41 40	0.2	0.05	0.3138	39	1.0
25.50	144.50	1 24	− 0.7	−0.07	.....	.....	.....	.....	.....	.....
25.00	144.50	.....	.....	.....	33 30	− 2.3	−0.06	0.3260	31	1.0
19.00	166.50	− 6 53	− 0.4	.....	26 05	− 1.1	.....	0.3064	−27	.....
17.50	144.00	− 0 47	− 2.0	−0.12	20 56	− 2.6	−0.05	0.3450	35	1.1
15.00	174.50	− 9 10	− 3.2	−0.11	21 54	− 7.2	−0.16	0.3160	29	0.9
14.50	146.00	.....	.....	.....	15 25	− 7.2	−0.23	0.3485	59	2.0
14.00	145.00	− 1 48	− 1.7	−0.11	.....	.....	.....	.....	.....	.....
11.00	179.00	−10 07	−13.0	−0.50	.....	.....	.....	.....	.....	.....
10.00	180.00	.....	.....	.....	15 50	1.1	0.16	0.3278	131	7.0

Table 48.

VERTICAL VARIATIONS OF THE MAGNETIC ELEMENTS IN JAPAN.

Position	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	XIII	XIV	XV	XVI	XVII
Latitude N.	° ′ 50 00	° ′ 48 00	° ′ 46 00	° ′ 43 30	° ′ 40 00	° ′ 38 30	° ′ 36 00	° ′ 35 30	° ′ 34 30	° ′ 32 30	° ′ 27 00	° ′ 26 30	° ′ 24 00	° ′ 16 30	° ′ 8 00	° ′ 7 30	° ′ 7 30
Longitude E.	155 00	142 30	150 00	142 30	126 30	140 30	138 00	127 30	134 00	131 00	142 00	128 00	121 00	146 00	167 30	150 00	134 30
$\frac{\partial X}{\partial r}$ per km.	γ −10.3	γ −11.8	γ −11.4	γ −12.6	γ −14.7	γ −13.6	γ −14.2	γ −15.4	γ −14.9	γ −15.5	γ −15.2	γ −16.7	γ −17.9	γ −16.2	γ −14.8	γ −16.8	γ −18.5
$-\frac{3X}{R}$ "	−11.0	−11.4	−11.9	−12.5	−13.6	−13.5	−14.0	−14.4	−14.4	−14.9	−15.4	−16.0	−16.8	−16.4	−15.6	−16.6	−17.8
Diff	+ 0.7	− 0.4	+ 0.5	− 0.1	− 1.1	− 0.1	− 0.2	− 1.0	− 0.5	− 0.6	+ 0.2	− 0.7	− 1.1	+ 0.2	+ 0.8	− 0.2	− 0.7
$\frac{\partial Y}{\partial r}$ per km.	γ − 4.0	γ − 3.9	γ − 3.3	γ − 3.1	γ − 3.1	γ − 2.3	γ − 2.1	γ − 2.4	γ − 2.0	γ − 1.9	γ − 1.0	γ − 1.4	γ − 1.5	γ − 0.1	γ + 0.7	γ + 0.6	γ + 0.2
$-\frac{3Y}{R}$ "	− 1.1	− 1.8	− 1.4	− 1.6	− 1.6	− 1.5	− 1.4	− 1.4	− 1.3	− 1.3	− 0.8	− 0.8	− 0.5	+ 0.1	+ 2.2	+ 1.0	+ 0.7
Diff	− 2.9	− 2.1	− 1.9	− 1.5	− 1.5	− 0.8	− 0.7	− 1.0	− 0.7	− 0.6	− 0.2	− 0.6	− 1.0	− 0.2	− 1.5	− 0.4	− 0.5
$\frac{\partial Z}{\partial r}$ per km.	γ −20.0	γ −22.0	γ −19.6	γ −19.1	γ −21.8	γ −18.3	γ −17.6	γ −19.3	γ −17.6	γ −17.1	γ −12.5	γ −13.4	γ −13.9	γ − 6.5	γ − 0.6	γ − 1.2	γ − 2.2
$-\frac{3Z}{R}$ "	−20.4	−21.6	−19.7	−19.6	−20.2	−17.6	−16.6	−17.6	−16.3	−15.6	−11.7	−12.4	−11.4	− 5.9	− 2.2	− 0.8	− 0.3
Diff	+ 0.4	− 0.4	+ 0.1	+ 0.5	− 1.6	− 0.7	− 1.0	− 1.7	− 1.3	− 1.5	− 0.8	− 1.0	− 2.5	− 0.6	+ 1.6	− 0.4	− 1.9
$\frac{\partial H}{\partial r}$ per km.	γ − 9.9	γ −11.1	γ −10.9	γ −12.1	γ −14.2	γ −13.3	γ −13.9	γ −15.1	γ −14.6	γ −15.3	γ −15.2	γ −16.6	γ −17.9	γ −16.2	γ −14.6	γ −16.7	γ −18.5
$-\frac{3H}{R}$ "	−11.0	−11.6	−11.9	−12.5	−13.7	−13.5	−14.1	−14.5	−14.5	−15.0	−15.4	−16.0	−16.8	−16.4	−15.6	−16.8	−17.8
Diff	+ 1.1	+ 0.5	+ 1.0	+ 0.4	− 0.5	+ 0.2	+ 0.2	− 0.6	− 0.1	− 0.3	+ 0.2	− 0.6	− 1.1	+ 0.2	+ 1.0	+ 0.1	− 0.7
$\frac{\partial \delta}{\partial r}$ per km.	′ −0.74	′ −0.78	′ −0.61	′ −0.60	′ −0.58	′ −0.44	′ −0.39	′ −0.44	′ −0.38	′ −0.34	′ −0.17	′ −0.22	′ −0.18	′ −0.03	′ +0.29	′ +0.16	′ +0.08
$\frac{\partial \theta}{\partial r}$ "	−0.06	−0.06	−0.06	−0.01	−0.02	−0.05	−0.06	−0.06	−0.06	−0.07	−0.07	−0.07	−0.14	−0.07	+0.13	−0.03	−0.17

Table 49.

OBSERVED AND CALCULATED VALUES OF THE MAGNETIC ELEMETS.

Station No.	Name	Declination Observed	Declination Calculated	Declination Diff. o–c	Dist.	Dip Observed	Dip Calculated	Dip Diff. o–c	Dist.	Horizontal Intensity Observed	Horizontal Intensity Calculated	Horizontal Intensity Diff. o–c	Dist.
		° ′	° ′	′		° ′	° ′	′		γ	γ	γ	
1	Simusyu Tô (占守島)	4 27.9	4 24.0	3.9	6	63 16.6	62 10.0	66.6	1	22879	23147	− 268	1
2	Paramusiru Tô (幌筵島)1	5 50.8	4 33.9	76.9	6	62 26.6	61 57.3	29.3	1	23295	23314	− 19	1
3	" ( )2	5 27.1	4 38.2	48.9	6	62 06.6	61 54.9	11.7	1	23154	23359	95	1
4	Onekotan Tô (溫禰古丹島)	3 44.5	4 48.4	− 63.9	6	61 00.0	61 19.2	− 19.2	1	23868	23731	137	1
5	Syasukotan Tô (捨子古丹島)	4 39.0	4 58.9	− 19.9	6	60 56.5	60 50.0	6.5	1	23844	24039	− 195	1
6	Ketoi Tô (計吐夷島)	5 13.9	5 22.7	− 8.8	6	59 36.5	59 44.1	− 7.6	1	24571	24715	− 144	1
7	Simusiru Tô (新知島)1	5 34.2	5 27.2	7.0	6	59 22.5	59 34.0	− 11.5	1	24948	24820	128	1
8	" ( )2	5 24.9	5 32.0	− 7.1	6	58 46.0	59 24.6	− 38.6	1	25232	24925	307	1
9	Uruppu Tô (得撫島)	6 45.5	5 55.6	49.9	6	59 04.4	58 59.7	4.7	1	25068	25254	− 186	1
10	Etorohu Sima (擇捉島)1	6 02.1	6 34.3	− 32.2	6	57 47.4	58 21.2	− 33.8	1	25887	25769	118	1
11	" ( )2	5 25.0	6 34.0	− 69.0	6	58 03.1	58 20.9	− 17.8	1	25743	25770	− 27	1
12	" ( )3	7 11.1	6 34.3	36.8	6	57 26.0	58 21.0	− 55.0	1	26202	25772	430	1
13	Kunasiri Sima (國後島)	6 12.4	7 04.1	− 51.7	6	56 39.2	57 26.1	− 46.9	1	26796	26363	433	1
14	Sikotan Sima (色丹島)	6 14.4	6 46.1	− 32.7	6	57 45.0	57 09.7	35.3	1	26102	26385	− 283	1
15	Sikuka (敷香)1	9 08.3	8 58.0	10.3	6	62 47.8	62 37.8	10.0	1	23942	23966	− 24	1
16	" ( )2	9 09.0	8 57.9	11.1	6	62 59.0	62 37.7	21.3	1	23799	23966	− 167	1
17	Usiro (鵜城)	9 22.0	9 23.8	− 1.8	6	62 41.8	62 28.4	13.4	1	24047	24157	− 110	1
18	Kaihyô Tô (海豹島)	8 32.1	8 09.7	22.4	6	61 56.7	61 46.2	10.5	1	24453	24335	118	1
19	Maoka (眞岡)1	9 07.0	8 56.0	11.0	6	60 54.5	60 50.4	4.1	1	25065	25070	− 5	1
20	" ( )2	9 12.4	8 56.2	16.2	6	60 52.5	60 50.3	2.2	1	25087	25069	18	1
21	Toyohara (豐原)	8 50.2	8 37.3	12.9	6	60 43.7	60 39.3	4.4	1	25077	25106	− 29	1
22	Ôtomari (大泊)	8 36.8	8 33.1	3.7	6	60 24.1	60 22.0	2.1	1	25268	25257	11	1
23	Kaiba Tô (海馬島)1	8 11.1	9 06.9	− 55.8	6	60 51.4	60 15.1	36.3	1	25354	25450	− 96	1
24	" ( )2	6 53.2	9 05.6	−132.4	6	62 24.0	60 13.7	130.3	1	24769	25461	− 692	1
25	" ( )3	7 41.0	9 05.4	− 84.4	6	60 43.0	60 12.4	30.6	1	25027	25471	− 444	1
26	" ( )4	7 46.3	9 06.1	− 79.8	6	60 12.7	60 12.2	0.5	1	25360	25475	− 115	1
27	Sôni (宗仁)1	8 53.2	8 46.2	7.0	6	60 07.0	59 55.9	11.1	1	25511	25553	− 42	1
28	" ( )2	8 51.8	8 45.9	5.9	6	60 04.3	59 54.7	9.6	1	25548	25562	− 14	1
29	" ( )3	8 54.4	8 45.5	8.9	6	60 04.4	59 54.1	10.3	1	25524	25567	− 43	1
30	Wakkanai (稚內)	8 42.3	8 20.4	21.9	1	59 21.7	59 21.7	0.0	1	25932	25861	71	1

Table 49.

OBSERVED AND CALCULATED VALUES OF THE MAGNETIC ELEMETS—Continued.

No.	Station Name		Dip Observed	Dip Calculated	Dip Diff. O–C	Dip Dist.	Horizontal Intensity Observed	Horizontal Intensity Calculated	Horizontal Intensity Diff. O–C	Horizontal Intensity Dist.	Declination Observed	Declination Calculated	Declination Diff. O–C	Declination Dist.
			° ′	° ′	′		γ	γ	γ		° ′	° ′	′	
31	Ositonari	(鴛泊)	I 59 56.2	59 15.1	41.1	I	26078	25954	124	I	8 54.8	8 21.8	33.0	I 59
32	Monbetu	(紋別)	I 58 00.2	58 04.6	4.4	I	26307	26314	7	I	7 48.6	7 39.3	9.3	I 58
33	Rumoi	(留萌)	I 57 36.8	57 54.6	17.8	I	26778	26550	228	I	8 19.7	7 52.8	26.9	I 57
34	Sibetu	(標津)	I 57 20.5	57 09.4	11.1	I	26318	26550	232	I	7 09.6	7 00.0	9.6	I 57
35	Sapporo	(札幌)	I 56 52.0	57 03.8	11.8	I	26896	26953	57	I	7 56.2	7 39.5	16.7	I 56
36	〃	〃	57	57	5.8	I	26910	26956	46	I	7 35.1	7 39.7	4.6	I 56
37	Siranuka	(白糠)	56	56	5.2	I	26805	26896	91	I	6 47.4	7 03.1	15.7	I 56
38	Saruhuto	(佐留太)	56	56	7.7	I	27063	27173	110	I	7 40.2	7 21.4	18.8	I 56
39	Setana	(瀬棚)	56	56	19.1	I	27485	27286	199	I	7 37.0	7 42.4	5.4	I 56
40	Biro-o	(虻尾)	55	55	10.3	I	27252	27213	39	I	6 58.3	7 01.1	2.8	I 55
41	Mori	(森)	56	56	3.3	I	27324	27412	88	I	7 17.4	7 29.1	11.7	I 56
42	Hukuyanna	(山口)	56	55	33.5	I	28072	27727	345	I	7 19.7	7 20.9	1.2	I 54
43	Nohezi	(地辺)	54	54	2.2	I	27837	27918	81	I	7 29.5	7 00.7	28.8	I 54
44	Azigasawa	(鰺ヶ澤)	54	54	3.9	I	27905	28003	38	I	7 03.1	7 07.6	4.5	I 54
45	Kuzi	(久慈)	54	53	6.3	I	28262	28158	104	I	6 30.7	6 40.7	10.0	I 54
46	Akita	(秋田)	53	53	5.0	I	28482	28451	31	I	6 39.8	6 48.6	8.8	I 53
47	〃	〃	53	53	7.0	I	28533	28453	80	I	6 49.1	6 48.2	0.9	I 53
48	Sakata	(酒田)	52	52	2.4	I	28813	28796	17	I	6 38.6	6 35.6	3.0	I 52
49	Onagawa	(女川)	52	51	6.4	I	28777	28870	93	I	6 06.7	6 11.6	4.9	I 51
50	Sendai	(仙臺)	51	51	3.8	I	28813	28979	166	I	6 21.0	6 13.8	7.2	I 51
51	〃	〃	52	51	10.6	I	28792	28991	199	I	6 48.5	6 13.7	34.8	I 52
52	Ebisu	(夷)	51	51	6.0	I	29260	29219	41	I	6 39.0	6 30.6	8.4	I 51
53	Aikawa	(相川)	51	51	4.0	I	29047	29250	203	I	6 43.0	6 31.0	12.0	I 52
54	〃	〃	51	51	8.7	I	29231	29258	27	I	6 33.6	6 30.6	3.0	I 51
55	Nagata	(新潟)	51	51	8.3	I	29096	29235	139	I	6 28.2	6 23.5	4.7	I 51
56	〃	〃	51	51	10.9	I	29043	29244	201	I	6 35.8	6 23.3	2.5	I 51
57	Wazima	(輪島)	51	51	0.9	I	29639	29597	42	I	6 29.3	6 26.0	3.3	I 51
58	〃	〃	51	51	7.0	I	29674	29599	75	I	6 15.7	6 26.0	10.3	I 51
59	Itoigawa	(糸魚川)	50	50	4.0	I	29515	29674	159	I	6 17.9	6 14.4	3.5	I 50
60	Ueda	(上田)	50	50	1.9	I	29428	29493	65	I	5 46.2	5 49.4	3.2	I 50
61	Sioya	(塩谷)	I 50 16.7	50 08.2	8.5	I	29998	30082	84	I	6 05.2	6 07.9	2.7	I 50
62	Saigô	(西郷)	I 51 03.5	50 25.8	37.7	I	30686	30319	370	I	6 54.5	6 10.7	43.8	I 51
63	Hisitura	(樋渡)I	I 50 19.6	50 20.7	1.1	I	30846	30377	469	I	5 48.5	6 08.6	20.1	I 50
63′	〃	〃2	I 50 20.7	50 20.7	81.7	I	29956	30377	421	I	6 01.6	6 08.6	7.0	I 51
64	Tyôsi	(千ノ)I	I 48 48.6	48 53.2	4.6	I	29886	29913	27	I	5 30.1	5 27.0	3.1	I 48
65	〃	〃2	I 48 22.7	48 52.9	30.2	I	30219	29917	302	I	5 04.6	5 27.2	22.6	I 48
66	Iida	(田中)I	I 49 00.6	48 59.0	1.6	I	30166	30257	97	I	5 40.8	5 45.9	5.1	I 49
67	〃	〃2	I 48 58.9	48 57.8	1.1	I	30153	30260	107	I	5 41.7	5 45.6	3.9	I 48
68	Obama	(濱)	I 49 12.7	49 13.6	0.9	I	30490	30431	59	I	5 58.6	5 54.3	4.3	I 49
69	Tottori	(鳥取)	I 49 34.7	49 25.5	9.2	I	30562	30544	18	I	6 04.7	6 03.2	1.5	I 49
70	Imaiti	(今市)	49 52.9	49 28.1	24.8	I	30494	30705	211	I	5 55.8	6 01.2	5.4	I 49
71	Kamogawa	(鴨川)	48 04.3	48 11.1	6.8	I	30094	30206	112	I	5 22.5	5 22.0	0.5	I 48
72	Tomida	(富田)	48 35.1	48 29.2	5.9	I	30430	30549	59	I	5 40.8	5 41.9	1.1	I 48
73	Kakegawa	(掛川)	48 04.3	48 01.6	2.7	I	30495	30514	19	I	5 21.6	5 30.7	9.1	I 48
74	Okayama	(岡山)	48 31.6	48 25.6	6.0	I	30912	30894	18	I	5 40.6	5 48.0	7.4	I 48
75	〃	〃2	48 19.3	48 24.4	5.1	I	31013	30901	112	I	5 31.3	5 47.8	16.5	I 48
76	Miyagawa	(川島)I	47 55.8	47 50.9	4.9	I	30702	30733	31	I	5 27.8	5 36.1	8.3	I 47
77	Hirosima	(広島)I	48 16.3	48 16.0	0.3	I	31242	31123	119	I	5 29.6	5 43.0	13.4	I 48
78	〃	〃2	48 12.9	48 15.5	2.6	I	31211	31124	87	I	5 56.5	5 42.9	13.6	I 48
79	Sumoto	(本ノ)I	47 55.1	47 52.3	2.8	I	30964	30947	17	I	5 29.4	5 40.1	10.7	I 47
80	〃	〃2	47 56.5	47 52.0	4.5	I	30942	30948	6	I	5 29.2	5 39.9	10.7	I 47
81	Yamaguti	(口ノ)I	48 09.8	48 08.5	1.3	I	31383	31277	106	I	5 23.8	5 37.6	13.8	I 48
82	Minabe	(部辺)I	47 08.9	47 04.6	4.3	I	31107	31125	18	I	5 17.8	5 27.6	9.8	I 47
83	Katuura	(勝浦)I	46 56.8	46 49.5	7.3	I	31059	31117	58	I	5 14.5	5 22.8	8.3	I 46
84	Siono Misaki	(潮ノ岬)I	46 45.8	46 36.6	9.2	I	31094	31201	107	I	5 05.0	5 19.9	14.9	I 46
85	Tokusima	(徳島)I	47 38.6	47 33.7	4.9	I	31075	31078	3	I	5 25.0	5 37.2	12.2	I 47
86	Imabari	(今治)I	47 51.0	47 46.3	4.7	I	31218	31206	12	I	5 24.3	5 35.5	11.2	I 47
87	Susaki	(須崎)I	46 59.1	46 51.1	8.0	I	31498	31445	37	I	5 15.9	5 24.4	8.5	I 46
88	Iztuhara	(築)I	48 35.0	48 30.6	4.4	I	31484	31469	15	I	5 30.2	5 28.1	2.1	I 48
89	〃	〃2	48 36.1	48 30.3	5.8	I	31437	31468	31	I	5 33.2	5 28.0	5.2	I 48
90	Nakatu	(中津)	47 34.5	47 26.2	8.3	I	31590	31499	91	I	5 16.8	5 15.6	1.2	I 47
91	Karatu	(唐津)	47 30.2	47 25.1	5.1	I	31933	31713	220	I	5 10.9	5 11.4	0.5	I 47
92	Sasebo	(佐世保)	46 53.2	47 04.7	11.5	I	31972	31863	109	I	4 53.4	5 04.6	11.2	I 46
93	Saeki	(佐伯)	46 46.1	46 28.3	17.8	I	31672	31676	4	I	5 15.0	5 00.5	14.5	I 46
94	Miyazi	(宮地)	46 48.1	46 33.9	14.2	I	31725	31784	59	I	4 37.2	5 00.1	22.9	I 46
95	Aso	(阿蘇)	47 36.9	46 30.8	66.1	I	31216	31819	603	2	4 30.8	4 58.9	28.1	I 47
96	Takamori	(高森)	47 35.5	46 23.7	48.2	I	32314	31834	480	2	5 36.8	4 57.3	39.5	I 45
97	Simabara	(島原)	46 30.5	46 28.6	1.9	I	31849	31940	91	2	4 51.2	4 56.6	5.4	I 46
98	Tomie	(富江)I	46 02.3	46 29.3	27.0	I	32007	32204	197	2	4 25.7	4 51.2	25.5	I 46
99	〃	〃2	46 11.0	46 28.8	17.8	I	32749	32206	543	2	4 47.9	4 51.0	3.1	I 46

Table 49.

OBSERVED AND CALCULATED VALUES OF MAGNETIC ELEMENTS—Continued.

Station			Declination					Dip					Horizontal Intensity			
No.	Name		Observed	Calculated	Diff. o–c	Dist.		Observed	Calculated	Diff. o–c	Dist.		Observed	Calculated	Diff. o–c	Dist.
			° ′	° ′	′			° ′	° ′	′			γ	γ	γ	
100	Miyazaki	(宮 崎)1	4 44.0	4 37.5	6.5	2		45 19.9	45 10.0	9.9	1		32191	32146	45	2
101	〃	(〃)2	5 01.7	4 37.2	24.5	2		45 33.4	45 09.3	24.1	1		31564	32147	− 583	2
102	Sibusi	(志 布 志)	4 23.3	4 27.4	− 4.1	2		44 38.1	44 35.8	2.3	1		32391	32363	28	2
103	Makurazaki	(枕 崎)	4 13.2	4 22.6	− 9.4	2		44 45.0	44 25.6	19.4	1		32339	32549	− 210	2
104	Nisino-omote	(西 ノ 表)	4 17.9	4 11.5	6.4	2		43 37.0	43 36.1	0.9	1		32650	32654	− 4	2
105	Nase	(名 瀬)1	3 24.6	3 21.6	3.0	2		39 57.4	40 27.3	− 29.9	1		33700	33705	− 5	2
106	〃	(〃)2	3 31.0	3 21.3	9.7	2		40 22.4	40 26.5	− 4.1	1		33628	33707	− 79	2
													C.G.S.	C.G.S.	C.G.S.	
107	Fugdin	(富 錦)	9 28.1	9 11.4	16.7	7		62 59.7	62 47.0	12.7	1		0.2314	0.2484	−0.0170	1
108	Chiangchiao	(江 橋)	8 12.1	7 36.5	35.6	7		63 59.7	64 02.7	− 3.0	1		0.2440	0.2483	−0.0043	1
109	Siaokuton	(小 古 洞)	9 13.1	8 40.7	32.4	7		62 21.7	62 19.3	2.4	1		0.2393	0.2536	−0.0143	1
110	Harbin	(哈 爾 賓)	8 23.1	8 07.0	16.1	7		62 40.7	62 26.5	14.2	1		0.2521	0.2554	−0.0033	1
111	Sanchan	(三 站)	8 15.1	7 50.9	24.2	7		62 26.7	62 22.0	4.7	1		0.2525	0.2567	−0.0042	1
112	Petuna	(扶 餘)	8 12.1	7 34.7	37.4	7		62 27.7	62 22.4	5.3	1		0.2548	0.2575	−0.0027	1
													γ	γ	γ	
113	Moukden	(奉 天)1	6 41.2	6 27.5	13.7	7		58 34.7	58 50.0	− 15.3	1		27742	27802	− 60	1
114	〃	(〃)2	6 42.9	6 27.1	15.8	7		58 43.9	58 49.6	− 5.7	1		27621	27805	− 184	1
115	Hulutao	(葫 蘆 島)1	6 11.2	5 30.2	41.0	7		57 44.6	58 07.7	− 23.1	1		28391	28381	10	1
116	〃	(〃)2	6 13.5	5 32.2	41.3	7		57 52.8	58 06.4	− 13.6	1		28195	28383	− 188	1
117	Eikô	(營 口)	5 58.2	5 53.0	5.2	7		57 54.3	57 47.6	6.7	1		28266	28425	− 159	1
118	Changshanssu	(長 山 寺)	5 45.4	5 17.9	27.5	7		57 14.6	57 49.2	− 34.6	1		28779	28572	207	1
119	Chaoshihkow	(趙 氏 溝)	6 16.4	6 12.1	4.3	7		56 35.0	56 28.2	6.8	1		28900	28861	39	1
120	Chang i Tau	(大 王 家 島)	6 05.4	5 48.3	17.1	7		56 01.4	56 11.2	− 9.8	1		29148	29102	46	1
121	Huranten	(普 蘭 店)	5 29.3	5 29.2	0.1	7		56 23.6	56 21.0	2.6	1		28956	29135	− 179	1
122	Syûsuisi	(周 水 子)	5 28.8	5 15.7	13.1	7		55 46.2	55 54.1	− 7.9	1		29347	29378	− 31	1
123	Ryozyun	(旅 順)	5 37.6	5 08.3	29.3	7		55 35.9	55 46.2	− 10.3	1		29575	29466	109	1
124	Yûki	(雄 基)1	7 41.4	7 50.9	− 9.5	7		58 03.9	58 02.8	1.1	1		27630	27533	97	1
125′	〃	(〃)2	8 02.3	7 51.0	11.3	7		58 00.2	58 02.5	− 2.3	1		27609	27534	75	1
126	Seisin	(清 津)1	5 51.6	7 38.4	−106.8	7		58 06.2	57 32.7	33.5	1		27632	27829	− 197	1
127	〃	(〃)2	6 51.6	7 38.1	− 36.5	7		57 39.9	57 32.1	7.8	1		27727	27836	− 109	1
128	Zyôsin	(城 津)1	7 04.3	7 17.1	12.8	7		56 31.0	56 24.5	6.5	1		28459	28407	52	1
129	〃	(〃)2	7 11.9	7 17.1	− 5.2	7		56 24.9	56 24.2	0.7	1		28501	28412	89	1
130	Hokusei	(北 青)	7 02.2	7 03.4	− 1.2	7		56 13.3	56 04.8	8.5	1		28683	28643	40	1
131	Gisyû	(義 州)	6 27.1	6 21.5	5.6	7		56 50.7	56 47.0	3.7	1		28507	28687	− 180	1
132	Kisen	(熙 川)	6 48.3	6 42.6	5.7	7		56 25.3	56 23.2	2.1	1		28680	28700	− 20	1
133	Genzan	(元 山)1	6 41.7	6 39.0	2.7	7		55 00.8	54 59.7	1.1	1		29238	29200	38	1
134	〃	(〃)2	6 41.8	6 39.1	2.7	7		55 01.6	54 59.1	2.5	1		29234	29202	32	1
135	〃	(〃)3	6 39.9	6 39.1	0.8	7		55 01.8	54 59.1	2.7	1		29232	29202	30	1
136	Heizyô	(平 壤)1	6 25.7	6 19.3	6.4	7		55 09.1	55 09.0	0.1	1		29361	29300	61	1
137	〃	(〃)2	6 20.2	6 18.6	1.6	7		55 11.2	55 07.5	3.7	1		29334	29312	22	1
138	Mukinho	(夢 金 浦)	5 56.9	5 54.2	2.7	7		54 14.4	54 18.8	− 4.4	1		29791	29752	39	1
139	Tyûmonsin	(仲 文 津)	6 24.5	6 30.1	− 5.6	7		53 13.0	53 13.1	− 0.1	1		29875	29786	89	1
140	Zinsen	(仁 川)	6 03.5	6 04.2	− 0.7	7		53 12.5	53 06.1	6.4	1		30048	30059	− 11	1
141	Gôsen	(鰲 川)	5 43.6	6 59.1	− 75.5	7		51 52.6	51 49.8	2.8	1		30603	30562	41	1
142	Kôkan	(黃 澗)	5 48.5	5 55.1	− 6.6	7		51 19.5	51 19.2	0.3	1		30661	30604	57	1
143	Hokô	(浦 項)	5 52.3	6 01.2	− 8.9	7		50 57.3	50 51.4	5.9	1		30563	30613	− 50	1
144	Sinsyû	(晋 州)	5 19.3	5 39.0	− 19.7	7		50 08.6	49 58.3	10.3	1		31070	31065	5	1
145	Moppo	(木 浦)1	5 17.0	5 17.2	− 0.2	7		49 48.9	49 44.8	4.1	1		31364	31335	29	1
146	〃	(〃)2	4 59.8	5 17.3	− 17.5	7		49 52.3	49 44.2	8.1	1		31403	31336	67	1
147	Kôkô	(高 興)	5 08.3	5 22.3	− 14.0	7		49 50.9	49 21.4	29.5	1		31133	31367	− 234	1
148	Kwan Tô	(莞 島)	4 54.3	5 12.6	− 18.3	7		48 56.9	49 03.5	− 6.6	1		31523	31528	− 5	1
149	Seizan Tô	(青 山 島)	4 26.4	5 12.8	− 46.4	7		49 13.2	48 52.4	20.8	1		31105	31564	− 459	1
150	Saisyû	(濟 州)1	4 59.5	4 56.7	2.8	7		49 09.0	48 02.8	66.2	1		31147	31891	− 744	1
151	〃	(〃)2	4 24.7	4 56.7	− 32.0	7		47 58.0	48 02.9	− 4.9	1		31939	31891	48	1
152	Zyôsanpo	(城 山 浦)	4 18.5	4 59.4	− 40.9	7		47 54.0	47 54.2	− 0.2	1		32164	31890	274	1
153	Sôki Po	(西 歸 浦)	4 22.2	4 52.3	− 30.1	7		47 37.2	47 40.6	− 3.4	1		32506	32007	499	1
154	Mosippo	(摹 瑟 浦)	5 03.2	4 49.0	14.2	7		47 38.5	47 42.4	− 3.9	1		32603	32033	570	1
155	Senzu, Ô Sima	(大 島 泉 津)	6 40.9	5 21.6	79.3	1		49 00.1	47 51.9	68.2	1		29523	30385	− 862	1
156	Motomura, 〃	(〃 元 村)	4 01.6	5 21.4	− 79.8	1		49 30.1	47 50.4	99.7	1		31339	30398	941	1
157	Mabusi, 〃	(〃 間 伏)	4 42.7	5 20.0	− 37.3	1		47 08.5	47 45.6	− 37.1	1		31171	30417	754	1
158	Habu 〃	(〃 波 浮)	7 11.4	5 19.6	111.8	1		48 37.7	47 44.8	52.9	1		30898	30414	484	1
159	Wakagô Nî Sima	(新 島 若 郷)	4 27.3	5 15.9	− 48.6	1		47 21.1	47 25.7	− 4.6	1		30543	30522	21	1
160	Honmura, 〃	(〃 本 村)	4 17.8	5 15.1	− 57.3	1		46 56.1	47 22.4	− 26.3	1		30744	30541	203	1
161	Ôkubo, Miyake Sima	(三宅島 大久保)	5 19.9	5 08.3	11.6	1		46 12.1	47 01.6	− 49.5	1		31412	30602	810	1
162	Akabakke, 〃	(〃 赤場𣘺)	3 49.9	5 07.8	− 77.9	1		44 03.0	47 00.0	−177.0	1		31349	30603	746	1
163	Ako, 〃	(〃 阿 古)	5 46.6	5 07.8	38.8	1		48 20.0	46 58.0	82.0	1		29400	30623	−1223	1
164	Tubota, 〃	(〃 坪 田)	5 39.3	5 06.9	32.4	1		48 03.2	46 56.6	66.6	1		30217	30617	− 400	1
165	Mitune Hatizyô Sima	(八丈島 三 根)	5 00.9	4 47.6	13.3	1		45 45.7	45 43.2	2.5	1		30234	30904	− 670	1
166	Ôgagô 〃	(〃 大賀郷)	5 51.5	4 47.3	64.2	1		44 38.7	45 41.8	− 63.1	1		31435	30912	523	1

Table 49.

OBSERVED AND CALCULATED VALUES OF THE MAGNETIC ELEMENTS—Continued.

Station			Declination					Dip					Horizontal Intensity				
No.	Name		Observed	Calculated		Diff. o–c	Dist.	Observed	Calculated		Diff. o–c	Dist.	Observed	Calculated		Diff. o–c	Dist.
			° ′	° ′		′		° ′	° ′		′		γ	γ		γ	
167	Nakanogô, Hatizyô Sima	(八丈島 中ノ郷)	5 48.6	4 46.3		62.3	7	46 52.0	45 38.8		73.2	1	31101	30919		182	1
168	Okumura, Titi Sima	(父島 奥村)	2 43.7	2 39.6		4.1	1	36 57.8	37 30.5		− 32.7	3	32124	32173		− 49	4
169	Ômura, 〃	(〃 大村)1	2 43.0	2 39.6		3.4	1	37 22.9	37 29.9		− 7.0	3	31963	32175		− 212	4
170	〃 〃	(〃 〃)2	2 42.4	2 39.6		2.8	1	37 34.0	37 29.8		4.2	3	32080	32176		− 96	4
171	Ôgiura, 〃	(〃 扇浦)	3 14.1	2 39.1		35.0	1	37 39.2	37 27.9		11.3	3	32335	32178		157	4
172	Susaki, 〃	(〃 洲崎)	2 16.3	2 39.2		− 22.9	1	37 47.8	37 27.9		19.9	3	31939	32180		− 241	4
173	Kitamura, Haha Sima	(母島 北村)	2 39.7	2 32.7		7.0	1	36 56.4	36 52.1		4.3	3	31882	32273		− 391	4
174	Higasi Minato, 〃	(〃 東港)	2 40.8	2 32.6		8.2	1	37 05.9	36 52.0		13.9	3	32269	32273		− 4	4
175	Nagahama, 〃	(〃 長濱)	2 38.5	2 32.2		6.3	1	35 43.5	36 50.3		− 66.8	3	32488	32278		210	4
176	Okimura, 〃	(〃 沖村)	2 22.6	2 31.4		8.8	1	36 53.5	36 46.8		6.7	3	32466	32283		183	4
177	Minami Saki, 〃	(〃 南崎)	2 28.0	2 30.7		2.7	1	37 13.6	36 43.6		30.0	3	32293	32289		4	4
178	Oki-no-Tori Sima	(沖ノ鳥島)1	0 51.5	0 45.9		5.6	2	27 08.0	26 58.6		9.4	3	34602	34544		58	2
179	〃	(〃)2	0 54.1	0 45.7		8.4	2	27 06.9	26 58.3		8.6	3	34588	34545		43	2
180	Naha	(那覇)1	2 51.3	2 37.4		13.9	2	36 56.9	36 55.9		1.0	2	34748	34673		75	2
181	〃	(〃)2	2 43.0	2 37.3		5.7	2	37 05.1	36 55.1		10.0	2	34672	34676		− 4	2
182	Miyako	(宮古)	2 10.3	2 07.1		3.2	2	34 54.6	34 44.2		10.4	2	35383	35434		− 51	2
183	Isigaki	(石垣)	1 59.4	1 55.7		3.7	2	34 08.9	33 58.6		10.3	2	35713	35725		− 12	2
184	Taihoku	(臺北)	2 08.7	1 59.0		9.7	2	35 17.8	35 16.8		1.0	2	35954	35816		138	2
185	Karenkô	(花蓮港)	1 26.0	1 40.8		− 14.8	2	33 39.6	33 27.6		12.0	2	36073	36142		− 69	2
186	Hôko Tô	(澎湖島)1	1 01.6	1 24.5		− 22.9	2	32 48.3	32 48.9		− 0.6	2	36298	36490		− 192	2
187	〃	(〃)2	1 27.7	1 24.5		3.2	2	32 45.8	32 48.9		− 3.1	2	36339	36490		− 151	2
187′	〃	(〃)2′	.....	.....		.....	2	32 43.1	32 48.5		− 5.4	2	36712	36491		221	2
188	〃	(〃)3	1 22.5	1 24.4		− 1.9	2	32 44.8	32 48.3		− 3.5	2	36670	36492		178	2
189	Toapanrâ	(大板埼)	1 03.1	1 03.6		− 0.5	2	29 51.2	29 55.6		− 4.4	2	36915	36835		80	2
190	Mougu Tô	(モウグ島)1	3 05.4	−0 11.6		197.0	2	25 02.1	25 54.1		− 52.0	2	33866	33556		310	5
191	〃	(〃)2	6 46.5	−0 11.8		418.3	2	32 50.3	25 52.5		417.8	2	31305	33562		−2257	5
192	Pagan Tô	(パガン島)1	−0 04.8	−0 47.8		43.0	2	24 44.6	22 36.0		128.6	2	33354	33845		− 491	5
193	〃	(〃)2	−0 30.8	−0 47.9		17.1	2	22 40.4	22 35.7		4.7	2	33434	33845		− 411	5
194	Saipan Tô	(サイパン島)1	−1 43.1	−1 33.2		− 9.9	2	17 24.6	17 20.9		3.7	2	34383	34440		− 57	5
195	〃	(〃)2	−1 47.9	−1 33.0		− 14.9	2	17 17.0	17 20.3		− 3.3	2	34460	34449		11	5
196	〃	(〃)3	−1 41.0	−1 34.2		− 6.8	2	17 12.7	17 13.2		− 0.5	2	34469	34458		11	5
197	Rota Tô	(ロタ島)	−1 52.1	−1 44.0		− 8.1	2	15 07.0	15 18.8		− 11.8	2	34770	34776		− 6	5
198	Urusi Tô	(ウルシ島)	−1 55.8	−1 58.9		3.1	2	6 47.3	7 05.4		− 18.1	2	36358	36318		40	3
199	Yappu Tô	(ヤップ島)	−1 52.6	−1 55.7		3.1	2	5 35.4	5 57.5		− 22.1	2	36809	36629		180	3
200	Kurrû Tô	(クツルー島)	−2 10.6	−2 05.7		− 4.9	2	3 23.1	3 20.6		2.5	2	36913	36893		20	3
201	Korôru Tô, Parao Syotô	(パラオ諸島 コロール島)1	−2 05.7	−2 02.4		− 3.3	2	0 45.6	1 06.0		− 20.4	2	37262	37457		− 195	3
202	〃 〃	(〃 〃)2	−2 07.9	−2 02.4		− 5.5	2	1 11.0	1 05.6		5.4	2	37487	37462		25	3
203	Marakaru Tô, 〃	(〃 マラカル島)	−2 20.9	−2 02.4		− 18.5	2	0 59.8	1 05.1		− 5.3	2	37511	37465		46	3
204	Tokobei Tô	(トコベイ島)	−2 38.2	−2 29.2		− 9.0	2	−8 50.0	−8 57.1		7.1	2	38152	38444		− 292	3
205	Huraarappu Tô	(フラアラップ島)	−2 37.7	−2 50.1		12.4	2	4 33.6	4 23.3		10.3	3	36094	36040		54	5
206	Orôru Tô	(オロール島)	−3 56.1	−3 39.7		− 16.4	2	5 21.6	4 49.2		32.4	3	35242	35201		41	5
207	Nomuuin Tô	(ノムウイン島)	−4 23.7	−4 05.3		− 18.4	2	5 05.4	4 48.5		16.9	3	35709	34932		777	5
208	Kita Sima, Torakku Syotô	(トラック諸島北島)	−4 22.3	−4 13.8		− 8.5	2	3 37.3	3 23.5		13.8	3	35597	35089		508	5
209	Matu Sima, 〃	(〃 松島)	−5 22.6	−4 19.4		− 63.2	2	0 51.7	2 46.2		−114.5	3	33982	35140		−1158	5
210	Take Sima, 〃	(〃 竹島)	−3 33.0	−4 19.6		46.6	2	1 57.0	2 43.7		− 46.7	3	35836	35145		691	5
211	Oda Sima, 〃	(〃 小田島)	−4 00.2	−4 21.9		21.7	2	3 02.1	2 19.5		42.6	3	35385	35189		196	5
212	Ororukku Tô	(オロルック島)	−4 32.7	−4 58.6		25.9	2	2 49.7	3 49.9		− 60.2	3	34434	34666		− 232	5
213	Namotikku Tô	(ナモチック島)	−3 17.5	−3 19.2		1.7	2	2 17.6	2 15.4		2.2	3	35761	35958		− 197	5
214	Mereyon Tô	(メレヨン島)	−3 00.0	−2 58.2		− 1.8	2	1 43.2	1 53.1		− 9.9	3	36285	36409		− 124	5
215	Ponape Tô	(ポナペ島)1	−6 13.2	−5 50.2		− 23.0	2	3 28.5	3 17.6		10.9	3	34709	34464		245	5
216	〃	(〃)2	−4 47.8	−5 50.3		62.5	2	2 07.2	3 12.7		− 65.5	3	34594	34474		120	5
217	〃	(〃)3	−6 14.9	−5 52.3		− 22.6	2	3 31.5	3 09.7		21.8	3	35086	34473		613	5
218	〃	(〃)4	−5 44.9	−5 49.3		4.4	2	4 06.9	3 05.3		61.6	3	35028	34498		530	5
219	〃	(〃)5	−6 06.1	−5 53.9		− 12.2	2	2 13.1	3 01.8		− 48.7	3	34755	34487		268	5
220	〃	(〃)6	−6 06.2	−5 53.0		− 13.2	2	1 35.9	2 55.0		− 79.1	3	35247	34505		742	5
221	〃	(〃)7	−6 00.2	−5 51.7		− 8.5	2	2 27.6	2 52.4		− 24.8	3	34929	34519		410	5
222	Rôsoppu Tô	(ローソップ島)	−4 40.4	−4 35.3		− 5.1	2	1 20.8	1 57.6		− 36.8	3	35033	35132		− 99	5
223	Kusai Tô	(クサイ島)	−6 50.1	−7 00.1		10.0	3	2 02.1	1 21.9		40.2	3	34087	34422		− 335	5
224	Satôwan Tô	(サトウワン島)	−5 10.3	−5 05.1		− 5.2	2	−0 53.4	−0 57.1		3.7	3	35525	35350		175	5
225	Nugôru Tô	(ヌゴール島)	−5 46.7	−5 37.3		− 9.4	2	−4 02.6	−3 42.6		− 20.0	3	35414	35532		− 118	5
226	Gurinitti Tô	(グリーニッチ島)	−5 34.5	−5 59.7		25.2	2	−9 22.4	−9 24.9		2.5	3	36189	36177		12	5
227	Pokaakku Tô	(ポカアック島)	−8 04.9	−7 48.5		− 16.4	3	21 16.2	19 48.9		87.3	3	31467	31903		− 436	5
228	Pikâru Tô	(ピカール島)	−8 44.0	−8 13.3		− 30.7	3	16 05.8	16 15.3		− 9.5	3	31528	32388		− 860	5
229	Eniwetakku Tô	(エニウェタック島)	−6 17.2	−6 28.7		11.5	3	12 03.0	12 22.0		− 19.0	3	33129	33097		32	5
230	Utorokku Tô	(ウトロック島)	−8 02.4	−8 12.0		9.6	3	14 23.4	14 24.7		− 1.3	3	33434	32638		796	5
231	Rongorappu Tô	(ロンゴラプ島)	−7 25.9	−7 33.9		8.0	3	13 18.8	13 17.7		1.1	3	32290	32813		− 523	5
232	Airukku Tô	(アイルック島)	−7 39.4	−8 15.0		35.6	3	12 47.8	12 39.6		8.2	3	33268	32873		395	5
233	Wozzie Tô	(ウオジエ島)	−8 29.3	−8 18.5		− 10.8	3	12 06.0	11 25.7		40.3	3	33440	33039		401	5

Table 49.

OBSERVED AND CALCACULATED VALUES OF THE MAGNETIC ELEMENTS—Continued.

Station			Declination				Dip				Horizontal Intensity			
No.	Name		Observed	Calculated	Diff. o–c	Dist.	Observed	Calculated	Diff. o–c	Dist.	Observed	Calculated	Diff. o–c	Dist.
			° ′	° ′	′		° ′	° ′	′		γ	γ	γ	
234	Kuezyerin Tô	(クェジェリン島)	−7 41.3	−7 50.0	8.7	3	8 50.2	9 15.0	− 24.8	3	33389	33326	63	5
235	Mire Tô	(ミレ島)	−9 08.9	−8 29.1	− 39.8	3	6 04.0	5 51.1	12.9	3	34128	33798	330	5
236	Yarûto Tô	(ヤルート島)	−8 10.7	−8 09.2	− 1.5	3	4 35.8	4 43.6	− 7.8	3	34126	33909	217	5
237	Ôtomari	(大泊)	8 40.8	8 33.2	7.6	6	.....	.....	.....		.....	.....	.....	
238	Zinsen	(仁川)	6 03.7	6 03.0	0.7	7	53 13.0	53 09.7	3.3	1	30027	30051	− 24	1
239	Kakioka	(柿岡)	5 45.5	5 42.4	3.1	1	49 28.8	49 33.9	− 5.1	1	29723	29796	− 73	1
240	Tsingtau	(青島)	4 33.0	4 10.2	22.8	2	52 05.1	52 32.9	− 27.8	1	30930	30933	− 3	1
241	Lukiapang	(蘆薈濱)	3 37.0	3 58.7	− 21.7	2	45 22.5	45 18.7	3.8	2	33313	33201	112	1
242	Taihoku	(臺北)	2 09.9	1 58.9	11.0	2	.....	.....	.....		.....	.....	.....	
243	Hongkong	(香港)	0 33.5	0 30.2	3.3	2	30 31.9	30 38.7	− 6.8	2	37363	37367	− 4	2
245	Antipolo	(アンチポーロー)	−0 27.3	−0 40.1	12.8	2	15 48.2	15 49.4	− 1.2	2	38270	38317	− 47	3
246	Parao	(パラオ)	−2 03.6	−2 02.4	− 1.2	2	.....	.....	.....		.....	.....	.....	

COMPLETE LIST OF MAGNETIC OBSERVATIONS

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS.

Tisima Rettô.

1. Simusyu Tô (占 守 島).

Lat. = 50° 43′ 15″ N., Long. = 156° 11′ 56″ E.

Height = 10 m.

Inst. No. 5.
Aug. 1933.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
27	16 37.2	4 27.7	B	A	T.O.	T.O.	28	7 15.7	4 25.3	B	A	T.O.	H.H.
〃	17 06.7	4 27.7	〃	〃	〃	〃	〃	8 11.6	4 27.5	〃	〃	〃	〃
〃	18 00.7	4 28.7	〃	〃	〃	〃	〃	8 59.6	4 29.3	〃	〃	Y.K.	〃
〃	19 06.9	4 26.0	〃	〃	〃	〃	〃	9 51.6	4 30.5	〃	〃	〃	〃
〃	19 55.3	4 27.6	〃	〃	〃	〃	〃	10 51.5	4 32.0	〃	〃	〃	〃
〃	21 02.8	4 27.9	〃	〃	〃	〃	〃	12 03.1	4 32.2	〃	〃	〃	〃
〃	22 01.5	4 27.6	〃	〃	〃	〃	〃	12 55.8	4 31.9	〃	〃	〃	〃
28	0 01.5	4 28.1	〃	〃	〃	〃	〃	13 54.9	4 30.4	〃	〃	〃	〃
〃	2 03.7	4 27.5	〃	〃	〃	〃	〃	14 58.4	4 28.9	〃	〃	H.H.	〃
〃	4 03.2	4 26.7	〃	〃	〃	〃	〃	15 58.9	4 27.6	〃	〃	〃	〃
〃	5 00.7	4 25.2	〃	〃	〃	H.H.	〃	17 00.8	4 27.1	〃	〃	〃	〃
28	5 54.8	4 24.6	〃	〃	〃	〃	28	18 02.8	4 28.2	〃	〃	〃	〃

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
27	18 42.6	63 15.2	T. Ogawa	H. Higasinaka
〃	18 45.6	63 14.3	〃	〃
〃	18 49.1	63 14.7	〃	〃
28	6 43.8	63 13.6	〃	〃
〃	6 53.8	63 14.3	〃	〃
28	13 24.1	63 14.8	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
27	19 27.1	22878	B	A	2	2	12.6	14.0	T. Ogawa	H. Higasinaka
〃	19 33.1	22878	〃	〃	〃	〃	12.7	14.0	〃	〃
28	5 26.4	22870	〃	〃	〃	〃	12.6	12.1	〃	〃
28	11 21.2	22860	〃	〃	〃	〃	17.1	14.8	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

2. Paramusiru Tô (幌 筵 島), 1.

Lat. = 50° 22′ 14″ N., Long. = 155° 36′ 16″ E.

Height = 2 m.

Inst. No. 5.
Aug. 1933.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
26	9 24.1	5 51.8	B	A	T.O.	H.H.	26	20 04.4	5 50.9	B	A	H.H.	H.H.
〃	10 00.2	5 53.9	〃	〃	〃	〃	〃	21 58.0	5 48.2	〃	〃	〃	〃
〃	11 00.9	5 56.2	〃	〃	〃	〃	〃	23 57.7	5 50.3	〃	〃	〃	〃
〃	11 54.5	5 57.0	〃	〃	〃	〃	27	1 58.5	5 49.9	〃	〃	〃	〃
〃	13 01.9	5 55.3	〃	〃	〃	〃	〃	3 57.8	5 48.5	〃	〃	〃	〃
〃	14 21.6	5 53.1	〃	〃	〃	〃	〃	4 55.8	5 48.0	〃	〃	〃	〃
〃	15 01.4	5 52.2	〃	〃	〃	〃	〃	6 00.2	5 47.8	〃	〃	T.O.	T.O.
〃	16 02.4	5 51.5	〃	〃	〃	〃	〃	7 05.1	5 47.9	〃	〃	〃	〃
〃	17 04.5	5 50.4	〃	〃	〃	〃	〃	8 01.0	5 50.2	〃	〃	〃	〃
〃	17 53.8	5 50.7	〃	〃	〃	〃	〃	9 01.9	5 53.7	〃	〃	〃	〃
26	18 53.5	5 50.5	〃	〃	〃	〃	27	9 52.5	5 56.1	〃	〃	〃	〃

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
26	13 33.6	62 23.3	T. Ogawa	H. Higasinaka
〃	13 38.1	62 23.2	〃	〃
〃	13 44.6	62 23.3	〃	〃
〃	18 27.9	62 24.6	〃	〃
〃	18 33.4	62 24.3	〃	〃
27	6 33.3	62 25.5	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
26	11 35.7	23281	B	A	2	2	18.0	15.7	T. Ogawa	H. Higasinaka
〃	11 41.5	23282	〃	〃	〃	〃	18.1	15.7	〃	〃
〃	19 47.9	23289	〃	〃	〃	〃	14.5	15.5	〃	〃
27	5 28.0	23285	〃	〃	〃	〃	13.2	13.0	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô—Continued.

3. Paramusiru Tô (幌 筵 島), 2.

Lat. = 50° 16′ 59″ N., Long. = 155° 20′ 08″ E.

Height = 3 m.

Inst. No. 5.
Aug. 1933.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
24	18 11.2	5 23.6	B	A	T.O.	H.H.	25	7 57.0	5 26.6	B	A	T.O.	H.H.
〃	18 14.2	5 23.5	〃	〃	〃	〃	〃	9 09.4	5 29.9	〃	〃	〃	〃
〃	18 59.3	5 27.2	〃	〃	〃	〃	〃	9 57.4	5 30.8	〃	〃	〃	〃
〃	20 29.6	5 23.8	〃	〃	〃	〃	〃	10 58.4	5 32.5	〃	〃	〃	〃
〃	21 38.1	5 26.4	〃	〃	〃	T.O.	〃	11 55.4	5 33.8	〃	〃	〃	〃
〃	22 05.8	5 26.8	〃	〃	〃	〃	〃	12 59.7	5 33.1	〃	〃	H.H.	〃
〃	23 08.3	5 27.0	〃	〃	〃	〃	〃	13 56.4	5 32.4	〃	〃	〃	〃
25	0 12.1	5 25.9	〃	〃	〃	〃	〃	14 59.6	5 27.8	〃	〃	〃	〃
〃	2 13.5	5 26.5	〃	〃	〃	〃	〃	16 00.1	5 27.6	〃	〃	〃	〃
〃	4 05.6	5 24.1	〃	〃	〃	〃	〃	17 01.4	5 24.5	〃	〃	〃	〃
〃	5 00.5	5 24.5	〃	〃	〃	〃	〃	18 00.1	5 26.5	〃	〃	〃	〃
〃	5 59.0	5 25.4	〃	〃	〃	H.H.	〃	18 45.6	5 26.2	〃	〃	〃	〃
25	7 04.8	5 25.3	〃	〃	〃	〃							

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
24	18 26.0	62 06.4	T. Ogawa	H. Higasinaka
〃	18 32.2	62 05.6	〃	〃
〃	18 37.2	62 05.0	〃	〃
25	6 34.8	62 03.3	〃	〃
〃	6 39.0	62 03.0	〃	〃
〃	13 12.2	62 04.7	〃	〃
25	13 20.2	62 04.0	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
24	19 28.2	23442	B	A	2	2	12.7	13.5	T. Ogawa	H. Higasinaka
〃	19 34.1	23444	〃	〃	〃	〃	12.7	13.5	〃	〃
25	5 34.5	23455	〃	〃	〃	〃	15.5	13.2	〃	〃
25	11 21.4	23436	〃	〃	〃	〃	18.8	15.4	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

4. Onekotan Tô (溫禰古丹島).

Lat. = 49° 27′ 26″ N., Long. = 154° 42′ 24″ E.

Height = 5 m.

Inst. No. 5.
Aug. 1933.

Declination

Date	Time		δ		Coil	Mag.	Obs'r	Rec'r	Date	Time		δ		Coil	Mag.	Obs'r	Rec'r
rd	h	m	°	′					rd	h	m	°	′				
23	5	47.7	3	40.5	B	A	T.O.	H.H.	23	17	58.6	3	42.1	B	A	H.H.	H.H.
〃	6	55.6	3	40.8	〃	〃	〃	〃	〃	19	15.0	3	46.4	〃	〃	〃	〃
〃	7	58.9	3	43.1	〃	〃	〃	〃	〃	19	56.3	3	45.6	〃	〃	〃	〃
〃	9	02.6	3	45.7	〃	〃	〃	〃	〃	20	50.8	3	45.0	〃	〃	〃	〃
〃	9	59.6	3	47.2	〃	〃	〃	〃	〃	22	03.8	3	46.2	〃	〃	〃	〃
〃	10	56.9	3	48.6	〃	〃	〃	〃	24th	0	04.0	3	41.9	〃	〃	〃	〃
〃	11	58.8	3	49.3	〃	〃	〃	〃	〃	1	55.4	3	42.8	〃	〃	〃	〃
〃	13	02.6	3	49.2	〃	〃	〃	〃	〃	4	38.6	3	42.0	〃	〃	〃	〃
〃	14	03.5	3	48.0	〃	〃	〃	〃	〃	5	22.6	3	41.6	〃	〃	〃	〃
〃	15	03.8	3	46.8	〃	〃	〃	〃	〃	6	08.9	3	41.4	〃	〃	〃	〃
〃	16	00.9	3	45.8	〃	〃	H.H.	〃	24	6	54.1	3	42.5	〃	〃	〃	〃
23	17	03.3	3	43.8	〃	〃	〃	〃									

Dip

Date	Time		θ		Observer	Recorder
rd	h	m	°	′		
23	6	26.1	60	57.7	T. Ogawa	H. Higasinaka
〃	6	31.1	60	57.3	〃	〃
〃	13	14.5	60	57.8	〃	〃
〃	18	24.3	60	58.2	〃	〃
24th	6	18.9	60	58.5	〃	〃

Horizontal Intensity

Date	Time		H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
rd	h	m	γ					°	°		
23	11	15.4	23852	B	A	2	2	14.5	13.2	T. Ogawa	H. Higasinaka
〃	11	25.1	23852	〃	〃	〃	〃	14.4	13.2	〃	〃
〃	11	43.6	23854	〃	〃	〃	〃	14.7	13.5	〃	〃
〃	19	29.0	23865	〃	〃	〃	〃	13.4	13.8	〃	〃
24th	5	34.9	23858	〃	〃	〃	〃	13.9	13.0	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

5. Syasukotan Tô (捨子古丹島).

Lat. = 48° 46′ 54″ N., Long. = 154° 02′ 34″ E.

Height = 1 m.

Inst. No. 5.
Aug. 1933.

Declination

Date	Time		δ		Coil	Mag.	Obs'r	Rec'r	Date	Time		δ		Coil	Mag.	Obs'r	Rec'r
th	h	m	°	′					th	h	m	°	′				
29	17	15.6	4	39.3	B	A	T. O.	H.H.	30	7	54.0	4	37.3	B	A	Y.K.	T. O.
〃	17	20.6	4	39.2	〃	〃	〃	〃	〃	9	07.1	4	38.5	〃	〃	〃	〃
〃	18	01.5	4	39.5	〃	〃	〃	〃	〃	10	04.8	4	40.3	〃	〃	T. O.	〃
〃	19	04.5	4	39.2	〃	〃	〃	〃	〃	11	00.0	4	42.6	〃	〃	〃	〃
〃	19	54.2	4	39.1	〃	〃	〃	〃	〃	11	52.2	4	42.8	〃	〃	〃	〃
〃	21	59.0	4	39.2	〃	〃	〃	〃	〃	13	03.1	4	42.5	〃	〃	〃	H.H.
30	0	02.3	4	38.8	〃	〃	H.H.	〃	〃	13	58.0	4	41.9	〃	〃	〃	〃
〃	2	01.8	4	38.3	〃	〃	〃	〃	〃	14	59.7	4	40.8	〃	〃	〃	〃
〃	3	57.0	4	37.3	〃	〃	〃	〃	〃	15	57.5	4	39.8	〃	〃	〃	〃
〃	5	05.0	4	36.7	〃	〃	〃	〃	〃	16	54.1	4	39.2	〃	〃	〃	〃
〃	6	01.3	4	36.3	〃	〃	Y.K.	T.O.	30	17	54.0	4	39.4	〃	〃	〃	〃
30	6	56.6	4	36.9	〃	〃	〃	〃									

Dip

Date	Time		θ		Observer	Recorder
th	h	m	°	′		
29	18	25.5	60	53.9	T. Ogawa	H. Higasinaka
〃	18	30.5	60	53.9	〃	〃
30	6	30.0	60	54.7	〃	〃
30	13	22.0	60	54.8	〃	〃

Horizontal Intensity

Date	Time		H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h	m	γ					°	°		
29	19	35.0	23842	B	A	2	2	13.7	15.5	T. Ogawa	H. Higasinaka
〃	19	42.5	23841	〃	〃	〃	〃	13.8	15.5	〃	〃
30	5	22.0	23839	〃	〃	〃	〃	11.5	12.6	〃	〃
〃	5	27.5	23838	〃	〃	〃	〃	11.2	12.6	〃	〃
30	11	22.5	23823	〃	〃	〃	〃	13.9	13.0	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

6. Ketoi Tô (計吐夷島).

Lat. = 47° 18′ 10″ N., Long. = 152° 29′ 00″ E.

Height = 5 m.

Inst. No. 5.
Sept. 1933.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
11	9 22.4	5 16.5	B	A	T. O.	H.H.	11	20 00.2	5 14.3	B	A	H.H.	T. O.
〃	10 03.7	5 16.8	〃	〃	〃	〃	〃	22 03.7	5 13.0	〃	〃	〃	〃
〃	11 04.4	5 17.1	〃	〃	〃	〃	12	0 03.3	5 13.6	〃	〃	〃	〃
〃	11 56.2	5 17.1	〃	〃	〃	〃	〃	2 02.2	5 12.7	〃	〃	〃	H.H.
〃	13 01.4	5 16.4	〃	〃	〃	〃	〃	4 01.1	5 13.4	〃	〃	〃	〃
〃	14 14.2	5 14.7	〃	〃	〃	〃	〃	5 00.7	5 12.7	〃	〃	〃	〃
〃	15 03.7	5 14.6	〃	〃	Y.K.	〃	〃	5 57.8	5 12.0	〃	〃	T. O.	T. O.
〃	16 02.8	5 13.7	〃	〃	〃	〃	〃	7 03.6	5 12.1	〃	〃	〃	〃
〃	17 06.2	5 13.9	〃	〃	〃	〃	〃	8 02.5	5 12.8	〃	〃	〃	〃
〃	18 00.7	5 14.4	〃	〃	〃	〃	〃	9 00.0	5 15.2	〃	〃	〃	〃
11	19 25.0	5 14.7	〃	〃	H.H.	T. O.	12	9 53.2	5 15.9	〃	〃	〃	〃

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
11	13 34.3	59 33.7	T. Ogawa	H. Higasinaka
〃	13 54.3	59 33.8	〃	〃
〃	18 21.5	59 35.4	〃	〃
12	6 30.9	59 34.2	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
11	11 32.8	24564	B	A	2	2	16.6	14.7	T. Ogawa	H. Higasinaka
〃	11 42.3	24567	〃	〃	〃	〃	16.5	14.8	〃	〃
〃	19 38.5	24557	〃	〃	〃	〃	11.5	12.0	〃	〃
12	5 34.9	24561	〃	〃	〃	〃	10.0	9.3	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

7. Simusiru Tô (新 知 島), 1.

Lat. = 47° 04′ 32″ N., Long. = 152° 11′ 15″ E.

Height = 3 m.

Inst. No. 5.
Sept. 1933.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
13	7 57.0	5 35.7	B	A	H.H.	T. O.	14	0 08.1	5 33.0	B	A	T. O.	T. O.
〃	8 26.7	5 36.2	〃	〃	〃	〃	〃	2 05.0	5 29.4	〃	〃	〃	〃
〃	8 58.6	5 37.3	〃	〃	〃	〃	〃	3 03.4	5 31.1	〃	〃	〃	〃
〃	10 03.7	5 38.5	〃	〃	〃	H.H.	〃	4 05.1	5 32.0	〃	〃	〃	〃
〃	11 02.5	5 39.3	〃	〃	〃	〃	〃	5 02.1	5 40.8	〃	〃	〃	〃
〃	12 06.0	5 38.7	〃	〃	〃	〃	〃	5 12.1	5 39.6	〃	〃	〃	〃
〃	12 11.3	5 38.4	〃	〃	〃	〃	〃	5 21.6	5 38.5	〃	〃	〃	〃
〃	13 03.1	5 37.3	〃	〃	〃	〃	〃	5 31.1	5 36.5	〃	〃	〃	〃
〃	14 08.4	5 36.5	〃	〃	〃	〃	〃	5 41.1	5 34.4	〃	〃	〃	〃
〃	15 03.5	5 34.9	〃	〃	〃	〃	〃	5 53.1	5 33.5	〃	〃	Y.K.	H.H.
〃	15 53.9	5 35.0	〃	〃	〃	〃	〃	6 13.4	5 33.8	〃	〃	〃	〃
〃	17 01.5	5 35.5	〃	〃	〃	T. O.	〃	6 27.3	5 34.3	〃	〃	T. O.	〃
〃	18 03.6	5 35.3	〃	〃	〃	〃	〃	6 41.6	5 34.8	〃	〃	H.H.	〃
〃	19 09.3	5 33.5	〃	〃	〃	〃	〃	6 48.9	5 34.9	〃	〃	〃	〃
〃	20 10.8	5 33.1	〃	〃	T. O.	〃	〃	7 19.9	5 35.1	〃	〃	〃	〃
13	22 08.5	5 31.4	〃	〃	〃	〃	14	7 58.2	5 36.9	〃	〃	〃	〃

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
13	13 22.0	59 20.0	T. Ogawa	H. Higasinaka
〃	13 26.5	59 19.4	〃	〃
〃	13 30.5	59 19.6	〃	〃
〃	18 50.6	59 20.2	〃	〃
14	6 57.6	59 21.3	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
13	11 27.3	24936	B	A	2	2	15.8	12.6	T. Ogawa	H. Higasinaka
〃	11 33.9	24937	〃	〃	〃	〃	16.1	12.6	〃	〃
〃	19 38.6	24949	〃	〃	〃	〃	7.6	10.8	〃	〃
14	6 03.1	24928	〃	〃	〃	〃	11.5	9.4	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

8. Simusiru Tô (新 知 島), 2.

Lat. = 46° 51′ 30″ N., Long. = 151° 51′ 49″ E.

Height = 5 m.

Inst. No. 5.
Sept. 1933.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
15	7 17.5	5 27.0	B	A	T. O.	H.H.	15	18 55.8	5 23.8	B	A	H.H.	H.H.
〃	8 00.1	5 27.1	〃	〃	〃	〃	〃	19 58.9	5 22.5	〃	〃	〃	〃
〃	8 48.5	5 27.9	〃	〃	〃	〃	〃	21 58.3	5 22.1	〃	〃	〃	〃
〃	10 13.4	5 27.9	〃	〃	〃	〃	〃	23 59.1	5 22.7	〃	〃	〃	〃
〃	11 01.6	5 27.2	〃	〃	〃	〃	16	2 19.5	5 25.2	〃	〃	〃	〃
〃	12 03.9	5 27.8	〃	〃	〃	〃	〃	4 06.8	5 22.3	〃	〃	〃	〃
〃	13 03.9	5 28.6	〃	〃	〃	〃	〃	5 03.8	5 22.1	〃	〃	〃	〃
〃	14 06.2	5 26.8	〃	〃	H.H.	〃	〃	5 59.8	5 22.8	〃	〃	〃	〃
〃	15 03.7	5 29.2	〃	〃	〃	〃	〃	7 02.6	5 24.8	〃	〃	T. O.	T. O.
〃	15 35.3	5 28.3	〃	〃	〃	〃	〃	8 01.7	5 26.3	〃	〃	〃	〃
〃	16 05.0	5 26.9	〃	〃	〃	〃	〃	9 04.7	5 27.8	〃	〃	〃	〃
〃	17 04.4	5 26.8	〃	〃	〃	〃	16	9 52.0	5 28.4	〃	〃	〃	〃
15	18 03.1	5 26.1	〃	〃	〃	〃							

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
15	13 46.7	58 45.3	T. Ogawa	H. Higasinaka
〃	13 50.7	58 45.4	〃	〃
〃	18 38.7	58 44.2	〃	〃
16	6 34.7	58 42.1	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
15	11 49.7	25220	B	A	2	2	13.6	13.6	T. Ogawa	H. Higasinaka
〃	11 55.7	25220	〃	〃	〃	〃	13.6	13.6	〃	〃
〃	19 32.7	25217	〃	〃	〃	〃	9.9	13.0	〃	〃
16	5 46.7	25229	〃	〃	〃	〃	10.0	9.8	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

9. Uruppu Tô (得 撫 島).

Lat. = 46° 12′ 54″ N., Long. = 150° 19′ 54″ E.

Height = 7 m.

Inst. No. 5.
Sept. 1933.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
9	12 24.8	6 45.3	B	A	T. O.	H.H.	10	3 09.9	6 44.6	B	A	T. O.	H.H.
〃	13 04.8	6 45.0	〃	〃	〃	〃	〃	3 59.9	6 44.3	〃	〃	〃	〃
〃	14 12.2	6 50.2	〃	〃	〃	〃	〃	5 02.7	6 42.9	〃	〃	H.H.	〃
〃	15 04.2	6 50.8	〃	〃	〃	〃	〃	6 00.5	6 43.1	〃	〃	〃	〃
〃	16 05.5	6 52.6	〃	〃	Y. K.	Y. K.	〃	7 04.7	6 42.9	〃	〃	〃	〃
〃	17 04.2	6 51.1	〃	〃	〃	〃	〃	8 01.2	6 44.4	〃	〃	〃	Y. K.
〃	17 56.3	6 47.5	〃	〃	〃	〃	〃	9 00.4	6 46.6	〃	〃	〃	〃
〃	18 04.2	6 49.3	〃	〃	H.H.	H.H.	〃	9 57.4	6 48.0	〃	〃	〃	〃
〃	18 30.0	6 45.5	〃	〃	〃	〃	〃	10 08.4	6 48.2	〃	〃	〃	〃
〃	19 22.8	6 45.0	〃	〃	〃	〃	〃	10 58.5	6 48.6	〃	〃	Y. K.	H.H.
〃	20 01.4	6 46.3	〃	〃	T. O.	T. O.	〃	11 11.3	6 48.8	〃	〃	〃	〃
〃	20 39.2	6 45.5	〃	〃	〃	〃	〃	12 12.0	6 50.2	〃	〃	〃	〃
〃	21 04.2	6 45.3	〃	〃	〃	〃	〃	13 01.6	6 48.5	〃	〃	〃	〃
〃	21 36.9	6 44.7	〃	〃	〃	〃	〃	13 58.9	6 47.3	〃	〃	H.H.	T. O.
〃	22 04.2	6 44.0	〃	〃	〃	〃	〃	15 01.8	6 42.8	〃	〃	〃	〃
〃	23 05.4	6 42.7	〃	〃	〃	〃	〃	16 07.9	6 43.9	〃	〃	〃	〃
10	0 04.5	6 42.4	〃	〃	〃	〃	〃	17 05.9	6 43.8	〃	〃	T. O.	〃
〃	1 07.4	6 43.5	〃	〃	〃	〃	10	18 00.6	6 41.8	〃	〃	〃	〃
10	2 06.4	6 46.1	〃	〃	〃	H.H.							

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
9	13 19.7	58 57.2	T. Ogawa	H. Higasinaka
〃	13 25.2	58 57.2	〃	〃
〃	18 59.9	59 04.7	〃	〃
〃	19 03.9	59 04.0	〃	〃
10	6 43.3	59 01.9	〃	〃
10	13 37.5	59 00.4	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
9	19 41.4	25048	B	A	2	2	19.2	18.7	T. Ogawa	H. Higasinaka
〃	19 46.4	25049	〃	〃	〃	〃	19.3	18.7	〃	〃
10	5 34.7	25067	〃	〃	〃	〃	13.5	16.0	〃	〃
〃	5 41.7	25067	〃	〃	〃	〃	13.6	16.0	〃	〃
10	11 32.9	25059	〃	〃	〃	〃	14.1	15.4	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

10. Etorohu Sima (擇 捉 島), 1.

Lat. = 45° 13′ 27″ N., Long. = 147° 52′ 38″ E.

Height = 3 m.

Inst. No. 5.
Oct. 1932.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
nd	h m	° ′					rd	h m	° ′				
22	15 14.6	6 03.4	A	C	A.M.	S. U.	23	13 00.3	6 04.3	A	C	A.M.	S. U.
〃	15 20.5	6 03.3	〃	〃	〃	〃	〃	13 57.4	6 03.1	〃	〃	〃	〃
〃	16 00.0	6 02.5	〃	〃	〃	〃	〃	13 59.9	6 02.9	〃	〃	〃	〃
〃	16 36.1	6 02.4	〃	〃	〃	〃	〃	14 55.5	6 02.3	〃	〃	〃	〃
〃	17 00.0	6 02.3	〃	〃	〃	〃	〃	14 59.6	6 02.2	〃	〃	〃	〃
〃	18 00.5	6 02.6	〃	〃	〃	〃	〃	15 57.7	6 02.2	〃	〃	〃	〃
〃	19 00.1	6 02.5	〃	〃	〃	〃	〃	16 00.5	6 02.2	〃	〃	〃	〃
〃	20 00.8	6 02.6	〃	〃	〃	〃	〃	16 56.6	6 02.3	〃	〃	〃	〃
〃	20 59.0	6 02.1	〃	〃	〃	〃	〃	16 59.9	6 02.6	〃	〃	〃	〃
〃	22 18.3	6 03.7	〃	〃	〃	〃	〃	17 32.2	6 03.4	〃	〃	〃	〃
23rd	0 00.9	6 00.7	〃	〃	〃	〃	〃	17 59.7	6 03.7	〃	〃	〃	〃
〃	0 29.9	5 59.8	〃	〃	〃	〃	〃	18 58.0	6 03.1	〃	〃	〃	〃
〃	0 59.5	5 59.8	〃	〃	〃	〃	〃	19 00.8	6 03.2	〃	〃	〃	〃
〃	1 57.4	5 59.4	〃	〃	〃	〃	〃	19 57.9	6 01.6	〃	〃	〃	〃
〃	2 00.0	5 59.2	〃	〃	〃	〃	〃	20 00.2	6 01.6	〃	〃	〃	〃
〃	2 59.3	6 00.0	〃	〃	〃	〃	〃	20 12.7	6 01.8	〃	〃	〃	〃
〃	3 58.6	6 01.1	〃	〃	〃	〃	〃	20 29.6	6 02.3	〃	〃	〃	〃
〃	4 01.2	6 01.2	〃	〃	〃	〃	〃	20 59.4	6 02.7	〃	〃	〃	〃
〃	4 59.5	6 03.6	〃	〃	〃	〃	〃	21 30.1	6 02.0	〃	〃	〃	〃
〃	5 57.9	6 03.6	〃	〃	〃	〃	〃	22 00.1	6 02.0	〃	〃	〃	〃
〃	6 01.1	6 03.6	〃	〃	〃	〃	〃	23 00.4	6 01.7	〃	〃	〃	〃
〃	6 41.1	6 02.8	〃	〃	〃	〃	〃	23 30.5	6 02.3	〃	〃	〃	〃
〃	6 58.7	6 02.5	〃	〃	〃	〃	24th	0 00.1	6 04.9	〃	〃	〃	〃
〃	7 01.7	6 02.5	〃	〃	〃	〃	〃	0 15.2	6 01.9	〃	〃	〃	〃
〃	7 36.8	6 02.3	〃	〃	〃	〃	〃	0 30.0	5 59.1	〃	〃	〃	〃
〃	7 57.4	6 02.7	〃	〃	〃	〃	〃	0 45.0	5 57.8	〃	〃	〃	〃
〃	8 00.3	6 02.6	〃	〃	〃	〃	〃	1 00.6	5 58.8	〃	〃	〃	〃
〃	8 58.7	6 02.9	〃	〃	〃	〃	〃	1 30.0	5 59.8	〃	〃	〃	〃
〃	9 01.1	6 02.9	〃	〃	〃	〃	〃	2 00.0	6 03.2	〃	〃	〃	〃
〃	9 57.8	6 04.8	〃	〃	〃	〃	〃	2 10.2	6 03.1	〃	〃	〃	〃
〃	10 00.2	6 04.7	〃	〃	〃	〃	〃	2 30.5	6 01.6	〃	〃	〃	〃
〃	10 57.2	6 04.9	〃	〃	〃	〃	〃	3 00.5	6 01.2	〃	〃	〃	〃
〃	11 00.7	6 05.0	〃	〃	〃	〃	〃	3 30.7	6 01.2	〃	〃	〃	〃
〃	11 58.4	6 05.0	〃	〃	〃	〃	〃	3 59.7	6 00.3	〃	〃	〃	〃
〃	12 00.7	6 05.0	〃	〃	〃	〃	〃	4 28.6	6 02.0	〃	〃	〃	〃
23	12 57.9	6 04.4	〃	〃	〃	〃	24	4 32.8	6 02.1	〃	〃	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

10. Etorohu Sima (擇 捉 島), 1—Continued.

Lat. = 45° 13′ 27″ N., Long. = 147° 52′ 38″ E.

Height = 3 m.

Inst. No. 5.
Oct. 1932.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
24	4 45.2	6 02.8	A	C	A.M.	S. U.	24	6 59.5	6 02.9	A	C	A.M.	S. U.
〃	5 00.2	6 02.7	〃	〃	〃	〃	〃	7 30.4	6 03.7	〃	〃	〃	〃
〃	5 31.9	6 03.2	〃	〃	〃	〃	〃	8 00.1	6 03.1	〃	〃	〃	〃
〃	5 59.9	6 03.0	〃	〃	〃	〃	〃	8 30.3	6 02.5	〃	〃	〃	〃
24	6 36.9	6 02.7	〃	〃	〃	〃	24	8 59.6	6 02.6	〃	〃	〃	〃

Dip

Date	Time	θ	Observer	Recorder
	° ′	° ′		
22nd	17 24.8	57 44.5	A. Muramoto	S. Urai
〃	17 30.7	57 44.4	〃	〃
23rd	6 22.8	57 44.6	〃	〃
〃	6 29.3	57 44.5	〃	〃
〃	13 28.7	57 44.5	〃	〃
23	13 33.7	57 44.4	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
	h m	γ					°	°		
22nd	16 24.6	25860	A	C	2	2	12.8	12.2	A. Muramoto	S. Urai
〃	16 29.6	25859	〃	〃	〃	〃	12.7	12.2	〃	〃
23rd	7 25.5	25861	〃	〃	〃	〃	17.0	12.0	〃	〃
〃	7 30.2	25860	〃	〃	〃	〃	17.0	12.0	〃	〃
〃	11 38.1	25857	〃	〃	〃	〃	19.9	13.9	〃	〃
23	11 42.6	25858	〃	〃	〃	〃	20.0	13.9	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

11. Etorohu Sima (擇 捉 島), 2.

Lat. = 45° 13′ 15″ N., Long. = 147° 53′ 50″ E.

Height = 10 m.

Inst No. 5.
Oct. 1932.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
	h m	° ′						h m	° ′				
28th	8 57.2	6 24.5	A	C	A.M.	S. U.	28th	13 00.4	6 26.9	A	C	A.M.	U. S.
〃	9 02.1	6 24.6	〃	〃	〃	〃	〃	13 14.8	6 26.6	〃	〃	〃	〃
〃	10 10.7	6 25.7	〃	〃	〃	〃	〃	13 38.2	6 26.1	〃	〃	〃	〃
〃	10 13.7	6 25.7	〃	〃	〃	〃	〃	14 00.3	6 25.5	〃	〃	〃	〃
〃	10 27.8	6 25.9	〃	〃	〃	〃	〃	14 03.3	6 25.5	〃	〃	〃	〃
〃	10 30.4	6 25.9	〃	〃	〃	〃	〃	14 34.2	6 24.7	〃	〃	〃	〃
〃	10 57.2	6 26.5	〃	〃	〃	〃	〃	14 57.6	6 24.4	〃	〃	〃	〃
〃	11 00.3	6 26.6	〃	〃	〃	〃	〃	15 00.0	6 24.2	〃	〃	〃	〃
〃	11 36.5	6 26.8	〃	〃	〃	〃	〃	15 50.5	6 24.2	〃	〃	〃	〃
〃	11 58.8	6 27.0	〃	〃	〃	〃	〃	15 57.5	6 24.1	〃	〃	〃	〃
〃	12 01.7	6 26.9	〃	〃	〃	〃	〃	15 59.7	6 24.1	〃	〃	〃	〃
〃	12 31.0	6 27.1	〃	〃	〃	〃	〃	16 58.8	6 24.0	〃	〃	〃	〃
28	12 57.5	6 26.9	〃	〃	〃	〃	28	17 02.1	6 24.1	〃	〃	〃	〃

Dip

Date	Time	θ	Observer	Recorder
	h m	° ′		
28th	9 55.7	58 00.1	A. Muramoto	S. Urai
〃	10 00.7	58 00.1	〃	〃
〃	13 23.9	58 00.2	〃	〃
28	13 28.1	58 00.0	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
	h m	γ					°	°		
28th	11 25.1	25714	A	C	2	2	20.6	11.1	A. Muramoto	S. Urai
〃	11 30.2	25715	〃	〃	〃	〃	20.5	11.1	〃	〃
〃	13 49.2	25716	〃	〃	〃	〃	20.6	13.5	〃	〃
28	13 53.8	25716	〃	〃	〃	〃	20.6	13.5	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

12. Etorohu Sima (擇 捉 島), 3.

Lat. = 45° 13′ 13″ N., Long. = 147° 52′ 36″ E.

Height = 38 m.

Inst. No. 5.
Oct. 1932.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
	h m	° ′						h m	° ′				
25th	9 03.2	7 11.2	A	C	A.M.	S. U.	26th	0 00.0	7 08.9	A	C	A.M.	S. U.
〃	9 59.8	7 12.0	〃	〃	〃	〃	〃	0 30.1	7 11.9	〃	〃	〃	〃
〃	11 00.9	7 13.7	〃	〃	〃	〃	〃	0 59.5	7 10.4	〃	〃	〃	〃
〃	12 00.3	7 14.5	〃	〃	〃	〃	〃	1 29.8	7 10.8	〃	〃	〃	〃
〃	12 59.6	7 14.1	〃	〃	〃	〃	〃	2 00.1	7 11.1	〃	〃	〃	〃
〃	14 00.1	7 13.2	〃	〃	〃	〃	〃	2 29.6	7 11.2	〃	〃	〃	〃
〃	14 59.9	7 12.8	〃	〃	〃	〃	〃	3 01.1	7 11.3	〃	〃	〃	〃
〃	16 00.2	7 12.2	〃	〃	〃	〃	〃	3 59.8	7 11.4	〃	〃	〃	〃
〃	16 59.7	7 11.6	〃	〃	〃	〃	〃	5 00.1	7 11.6	〃	〃	〃	〃
〃	17 45.3	7 12.2	〃	〃	〃	〃	〃	6 00.1	7 11.8	〃	〃	〃	〃
〃	18 00.5	7 11.4	〃	〃	〃	〃	〃	6 16.4	7 11.6	〃	〃	〃	〃
〃	18 30.5	7 10.8	〃	〃	〃	〃	〃	7 00.0	7 11.6	〃	〃	〃	〃
〃	19 00.0	7 11.5	〃	〃	〃	〃	〃	7 33.9	7 11.4	〃	〃	〃	〃
〃	19 30.6	7 11.8	〃	〃	〃	〃	〃	7 59.9	7 11.1	〃	〃	〃	〃
〃	19 59.9	7 11.9	〃	〃	〃	〃	〃	8 30.1	7 11.0	〃	〃	〃	〃
〃	20 29.9	7 11.5	〃	〃	〃	〃	〃	8 59.9	7 10.9	〃	〃	〃	〃
〃	21 00.0	7 11.6	〃	〃	〃	〃	〃	9 29.3	7 10.6	〃	〃	〃	〃
〃	21 30.2	7 09.7	〃	〃	〃	〃	〃	10 00.1	7 11.2	〃	〃	〃	〃
〃	22 00.0	7 09.8	〃	〃	〃	〃	〃	10 29.7	7 11.5	〃	〃	〃	〃
〃	22 29.6	7 08.9	〃	〃	〃	〃	〃	10 59.6	7 12.2	〃	〃	〃	〃
〃	23 00.5	7 09.0	〃	〃	〃	〃	〃	11 15.3	7 12.8	〃	〃	〃	〃
25	23 29.7	7 08.9	〃	〃	〃	〃	26	12 00.6	7 13.6	〃	〃	〃	〃

Dip

Date	Time	θ	Observer	Recorder
	h m	° ′		
25th	13 26.6	57 23.1	A. Muramoto.	S. Urai
〃	13 31.7	57 23.0	〃	〃
〃	17 23.9	57 23.5	〃	〃
〃	17 29.8	57 23.5	〃	〃
26	6 27.6	57 22.4	〃	〃
26	6 34.4	57 22.4	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
	h m	γ					°	°		
25th	11 26.8	26158	A	C	2	2	16.3	12.0	A. Muramoto	S. Urai
〃	11 32.0	26158	〃	〃	〃	〃	16.3	12.0	〃	〃
〃	16 33.2	26175	〃	〃	〃	〃	10.6	12.0	〃	〃
〃	16 41.1	26172	〃	〃	〃	〃	11.1	12.0	〃	〃
26	7 22.5	26191	〃	〃	〃	〃	10.9	9.5	〃	〃
〃	7 27.1	26189	〃	〃	〃	〃	11.5	9.5	〃	〃
〃	11 23.9	26184	〃	〃	〃	〃	12.5	9.7	〃	〃
26	11 28.4	26185	〃	〃	〃	〃	12.4	9.7	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

13. Kunasiri Sima (國 後 島).

Lat. = 44° 01′ 25″ N., Long. = 145° 51′ 44″ E.

Height = 20 m.

Inst. No. 5.
Sept. 1933.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
	h m	° ′						h m	° ′				
21st	9 02.6	6 12.8	B	A	T. O.	H.H.	21st	21 58.9	6 13.0	B	A	T. O.	T. O.
〃	9 52.6	6 14.3	〃	〃	〃	〃	〃nd	23 01.3	6 12.9	〃	〃	〃	〃
〃	10 56.7	6 15.9	〃	〃	〃	〃	22	0 03.0	6 12.1	〃	〃	〃	〃
〃	11 57.3	6 15.9	〃	〃	〃	〃	〃	1 48.8	6 12.1	〃	〃	〃	〃
〃	12 57.0	6 15.3	〃	〃	〃	T. O.	〃	4 18.9	6 12.1	〃	〃	〃	〃
〃	14 02.4	6 14.0	〃	〃	〃	〃	〃	5 06.1	6 11.6	〃	〃	〃	H.H.
〃	15 08.9	6 13.7	〃	〃	〃	〃	〃	6 09.1	6 10.6	〃	〃	〃	〃
〃	16 05.4	6 13.3	〃	〃	〃	〃	〃	7 02.9	6 10.1	〃	〃	〃	〃
〃	17 05.4	6 13.1	〃	〃	〃	〃	〃	7 57.6	6 09.8	〃	〃	H.H.	〃
〃	18 01.9	6 13.3	〃	〃	〃	〃	〃	8 24.1	6 10.5	〃	〃	〃	〃
〃	19 11.8	6 13.2	〃	〃	〃	〃	〃	8 55.0	6 11.0	〃	〃	〃	〃
〃	20 00.5	6 10.0	〃	〃	〃	〃	22	9 56.9	6 12.4	〃	〃	〃	〃
21	20 59.9	6 12.2	〃	〃	〃	〃							

Dip

Date	Time	θ	Observer	Recorder
	h m	° ′		
21st	13 23.2	56 36.3	T. Ogawa	H. Higasinaka
〃	13 28.2	56 37.2	〃	〃
〃	13 33.7	56 36.5	〃	〃
〃nd	18 19.2	56 36.9	〃	〃
22	6 24.7	56 37.4	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
	h m	γ					°	°		
21st	11 38.7	26788	B	A	2	2	17.2	18.9	T. Ogawa	H. Higasinaka
〃	11 45.2	26788	〃	〃	〃	〃	17.4	18.7	〃	〃
〃nd	19 27.2	26783	〃	〃	〃	〃	15.6	16.2	〃	〃
22	5 27.7	26788	〃	〃	〃	〃	14.4	14.5	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Tisima Rettô — Continued.

14. Sikotan Sima (色 丹 島).

Lat. = 43° 51′ 50″ N., Long. = 146° 49′ 47″ E.

Height = 2 m.

Inst. No. 5.
Oct. 1932.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
	h m	° ′						h m	° ′				
7th	14 01.6	6 18.3	A	C	A.M.	S. U.	8th	6 01.1	6 14.3	A	C	A.M.	S. U.
〃	14 59.3	6 16.7	〃	〃	〃	〃	〃	7 01.7	6 13.7	〃	〃	〃	〃
〃	15 29.4	6 16.0	〃	〃	〃	〃	〃	8 00.2	6 13.5	〃	〃	〃	〃
〃	16 01.3	6 15.3	〃	〃	〃	〃	〃	8 30.8	6 13.3	〃	〃	〃	〃
〃	17 00.9	6 15.1	〃	〃	〃	〃	〃	9 01.9	6 13.4	〃	〃	〃	〃
〃	18 00.3	6 15.1	〃	〃	〃	〃	〃	10 01.3	6 14.3	〃	〃	〃	〃
〃	18 34.2	6 14.8	〃	〃	〃	〃	〃	11 01.7	6 16.5	〃	〃	〃	〃
〃	19 00.3	6 14.8	〃	〃	〃	〃	〃	11 42.1	6 17.4	〃	〃	〃	〃
〃	20 00.1	6 14.8	〃	〃	〃	〃	〃	12 00.6	6 17.7	〃	〃	〃	〃
〃	22 01.0	6 14.8	〃	〃	〃	〃	〃	13 01.1	6 17.8	〃	〃	〃	〃
8	0 00.4	6 14.6	〃	〃	〃	〃	〃	14 00.5	6 17.0	〃	〃	〃	〃
〃	1 59.9	6 13.5	〃	〃	〃	〃	8	15 00.6	6 15.6	〃	〃	〃	〃
8	4 00.1	6 13.8	〃	〃	〃	〃							

Dip

Date	Time	θ	Observer	Recorder
	h m	° ′		
7th	16 34.6	57 41.9	A. Muramoto	S. Urai
〃	16 41.3	57 41.8	〃	〃
8	6 24.6	57 42.0	〃	〃
〃	6 29.5	57 42.2	〃	〃
〃	13 27.0	57 42.0	〃	〃
8	13 31.6	57 42.0	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
	h m	γ					°	°		
7th	17 36.7	26082	A	C	2	2	13.4	13.5	A. Muramoto	S. Urai
〃	17 44.8	26080	〃	〃	〃	〃	13.6	13.5	〃	〃
8	7 39.0	26073	〃	〃	〃	〃	12.7	8.8	〃	〃
〃	7 46.5	26072	〃	〃	〃	〃	14.4	8.8	〃	〃
〃	11 29.7	26068	〃	〃	〃	〃	20.1	11.8	〃	〃
8	11 34.4	26070	〃	〃	〃	〃	19.4	11.8	〃	〃

Table 50.—COMPLETE LIST OF MAGNETIC OBSERVATIONS—Continued.

Karahuto.

15. Sikuka (敷　香), 1.

Lat. = 49° 13′ 42″ N.,　Long. = 143° 06′ 51″ E.

Height = 2 m.

Inst. No. 5.
Sept. 1932.

Declination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
12	18 10.9	9 09.1	A	C	A.M.	S. U.	13	10 00.2	9 10.7	A	C	A.M.	S. U.
〃	19 01.0	9 08.9	〃	〃	〃	〃	〃	10 59.8	9 12.6	〃	〃	〃	〃
〃	20 28.6	9 09.1	〃	〃	〃	〃	〃	12 00.0	9 12.9	〃	〃	〃	〃
〃	22 00.0	9 08.9	〃	〃	〃	〃	〃	12 59.0	9 12.4	〃	〃	〃	〃
13	0 00.4	9 07.9	〃	〃	〃	〃	〃	14 01.2	9 10.6	〃	〃	〃	〃
〃	2 00.4	9 07.3	〃	〃	〃	〃	〃	15 01.8	9 09.4	〃	〃	〃	〃
〃	4 00.1	9 06.3	〃	〃	〃	〃	〃	15 59.6	9 09.0	〃	〃	〃	〃
〃	5 00.9	9 06.3	〃	〃	〃	〃	〃	17 00.9	9 08.3	〃	〃	〃	〃
〃	5 58.6	9 06.4	〃	〃	〃	〃	〃	18 01.4	9 08.4	〃	〃	〃	〃
〃	7 01.2	9 07.7	〃	〃	〃	〃	〃	19 00.1	9 08.4	〃	〃	〃	〃
〃	8 00.6	9 08.0	〃	〃	〃	〃	13	20 00.7	9 08.8	〃	〃	〃	〃
13	9 00.6	9 08.4	〃	〃	〃	〃							

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
12	19 38.8	62 44.9	A. Muramoto	S. Urai
〃	19 52.5	62 44.5	〃	〃
13	5 24.6	62 44.8	〃	〃
〃	5 32.3	62 45.6	〃	〃
〃	13 29.1	62 45.4	〃	〃
13	13 33.7	62 44.6	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
12	18 32.0	23919	A	C	2	2	12.8	15.6	A. Muramoto	S. Urai
〃	18 37.1	23918	〃	〃	〃	〃	12.8	15.6	〃	〃
13	6 26.8	23904	〃	〃	〃	〃	12.4	10.3	〃	〃
〃	6 33.6	23902	〃	〃	〃	〃	12.4	10.3	〃	〃
〃	11 27.6	23921	〃	〃	〃	〃	19.2	12.4	〃	〃
13	11 34.1	23922	〃	〃	〃	〃	19.6	12.5	〃	〃

Table 50.—COMPLET LIST OF MAGNETIC OBSERVATIONS—Continued.

Karahuto — Continued.

16. Sikuka (敷　香), 2.

Lat. = 49° 13′ 32″ N.,　Long. = 143° 06′ 51″ E.

Height = 1 m.

Inst. No. 5.
Sept. 1932.

Diclination

Date	Time	δ	Coil	Mag.	Obs'r	Rec'r	Date	Time	δ	Coil	Mag.	Obs'r	Rec'r
th	h m	° ′					th	h m	° ′				
15	8 57.1	9 11.0	A	C	A.M.	S. U.	15	21 04.4	9 09.7	A	C	A.M.	S. U.
〃	10 01.6	9 12.8	〃	〃	〃	〃	〃	21 59.9	9 09.7	〃	〃	〃	〃
〃	10 57.9	9 13.9	〃	〃	〃	〃	〃	23 58.5	9 07.6	〃	〃	〃	〃
〃	11 59.9	9 13.7	〃	〃	〃	〃	16	2 00.3	9 07.8	〃	〃	〃	〃
〃	13 00.2	9 13.1	〃	〃	〃	〃	〃	4 00.0	9 07.8	〃	〃	〃	〃
〃	14 01.5	9 11.7	〃	〃	〃	〃	〃	4 58.6	9 07.3	〃	〃	〃	〃
〃	14 59.3	9 10.4	〃	〃	〃	〃	〃	5 59.0	9 06.6	〃	〃	〃	〃
〃	16 00.7	9 09.5	〃	〃	〃	〃	〃	7 00.2	9 07.5	〃	〃	〃	〃
〃	17 01.8	9 08.8	〃	〃	〃	〃	〃	8 03.2	9 08.7	〃	〃	〃	〃
〃	18 04.8	9 08.9	〃	〃	〃	〃	〃	9 00.1	9 10.0	〃	〃	〃	〃
〃	19 00.7	9 09.2	〃	〃	〃	〃	16	10 00.5	9 11.5	〃	〃	〃	〃
15	19 58.5	9 09.4	〃	〃	〃	〃							

Dip

Date	Time	θ	Observer	Recorder
th	h m	° ′		
15	13 23.4	62 55.5	A. Muramoto	S. Urai
〃	13 29.9	62 55.9	〃	〃
〃	17 47.0	62 56.2	〃	〃
〃	17 53.0	62 56.0	〃	〃
16	5 24.9	62 56.2	〃	〃
16	5 30.5	62 56.5	〃	〃

Horizontal Intensity

Date	Time	H	Coil	Mag.	Cell	Resist.	t_c	t_s	Observer	Recorder
th	h m	γ					°	°		
15	11 26.4	23762	A	C	2	2	22.1	14.9	A. Muramoto	S. Urai
〃	11 32.5	23765	〃	〃	〃	〃	22.2	15.0	〃	〃
〃	18 27.8	23782	〃	〃	〃	〃	17.5	19.0	〃	〃
〃	18 33.9	23782	〃	〃	〃	〃	17.4	19.0	〃	〃
16	6 26.5	23767	〃	〃	〃	〃	14.1	14.0	〃	〃
16	6 32.8	23767	〃	〃	〃	〃	14.3	14.0	〃	〃