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TERRESTRIAL MAGNETISM

Field Magnetic Observations in Antarctica

by

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- II. Declination measurements
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P L A T E

Map showing positions of Australian Observatory
and Field Magnetic Stations in Antarctica

A B S T R A C T

This record presents, in tabular form, the results of magnetic observations made at field stations in Antarctica since 1954. The data is entirely observational; no attempt has been made to analyse it or to compile maps from it. It is intended that this data will contribute to the production of magnetic maps of Antarctica which will incorporate all the field magnetic observations made over the continent.

1. INTRODUCTION

The Australian National Antarctic Research Expedition (A.N.A.R.E.) established its station at Mawson on the coast of MacRobertson Land, on the Antarctic continent, in the summer of 1953-54. Since that time, as part of Australia's scientific programme in the Antarctic, members of the expedition have made measurements of the direction and intensity of the earth's magnetic field at many points along the coast of the Australian Antarctic Territory, and on two field traverses which reached about 350 miles southward from Mawson.

The majority of these observations have been made by geophysicists of the Bureau of Mineral Resources, Geology and Geophysics who were appointed to the expeditions. Other measurements of declination only have been made by various members of A.N.A.R.E. field parties. The results of these observations are summarised in Tables I - III. The positions of the field stations and Mawson Observatory are shown on Fig.1.

2. INSTRUMENTS

Determinations of horizontal intensity were made in most cases with a quartz horizontal magnetometer of either the La Cour type (QHM) or the Askania type (HTM). For a few observations it was necessary to use the method of oscillations and deflections with an Askania magnetometer to obtain the value of the horizontal intensity.

Declination was obtained at some places with a QHM, and at others with an Askania declinometer. The results recorded in Tables II and III were obtained with a high quality magnetic compass attached to a theodolite of either Watts or Wild make.

Descriptions of the QHM and the procedure for its use in determining the horizontal intensity and declination are to be found in reports by Ingall (1955) and McGregor (1956).

Vertical intensity was measured with a magnetometric zero balance (BMZ) at nearly all places. This instrument and procedure for its use are adequately described by Ingall (1955).

3. TREATMENT OF DATA

Instrument corrections to International Magnetic Standard (IMS) have not been applied to the values in Table I, but they are known to be less

than 1 minute for declination, and less than 10 gammas for horizontal and vertical intensity. The compasses used for the declination measurements recorded in Tables II and III were calibrated at Mawson, and appropriate corrections have been made.

The observed value of any magnetic element at a particular station may depart considerably from the mean value for that station, except in the case of Mawson Observatory. No attempt has been made to correct for time variations at the field stations, because it is uncertain to what extent time variations at an observatory are representative of neighbouring stations at high latitudes. In the tables the letters Q or D are used to indicate quiet or disturbed conditions at Mawson, and so indicate which data are likely to be unreliable because of disturbed magnetic conditions.

4. DISCUSSION

The distribution of the locations at which these observations have been made is not suitable for determining the field on a regional scale, except in the broadest way. Therefore no attempt has been made to present this information in the form of iso-magnetic maps. It is to be hoped that all the field magnetic results for the Antarctic region will be collected by one authority who will undertake the task of preparing iso-magnetic maps. This record has been prepared principally to provide basic data for such a project.

5. REFERENCES

- Ingall, L.N., 1955 - Magnetic results from Heard Island, 1952, Bur.Min.Res.Geol. and Geophys., Rep.No.21.
- McGregor, P.M., 1956 - Magnetic results from Macquarie Island, 1952, Bur.Min.Res.Geol. and Geophys., Rep.No.27.

TABLE I

MAGNETIC OBSERVATIONS - ANTARCTICA

S t a t i o n Long. E S	Lat. S	Name	Date	Declination		Horizontal Intensity		Vertical Intensity		Conditions at Mawson
				G.M.T. Value	Value	G.M.T. Value	Y	G.M.T. Value	Y	
47°56'	67°34'	Pinn I. (Casey Bay)	10/10/57 11/10/57	12:41	49°46'W	13:15	18244	11:28	45030	Q
50°29'	66°59'	Observation I. (Amundsen Bay)	25/10/56 4/10/57	49 39 10:18 48 26		18785		06:00	44918	Q
51°20'	66°13'	Mt. Biscoe	4/10/57	6:57	50 16				44670	Q
52°43'	67°28'	McLeod Nunataks.	4/11/58					08:38	45936	Q
53°42'	65°51'	Proclamation I.	4/10/57	4:33	42 42			04:59	25555	Q
56°26'	67°54'	Leckie Range	6/10/58					07:14	18651	Q
57°20'	66°56'	King Edward VIII Gulf	7/11/54 2/11/56	54 45 55 41				18:18	48014	Q
59°20'	67°21'	Transverse I. (Steffanson Bay)	13/ 9/58 18/11/54	55 50 48 45				08:58	18087	Q
60°42'	67°25'	Blake I.	18/ 5/56	56 45				18550	47506	D
60°54'	67°27'	Taylor Station	20/11/54	56 45						
61°07'	67°28'	Byrd Head	3/11/57	9:33	58 14			9:39	18954	Q
62°53'	67°36'	Mawson (Observatory)	21/10/54 15/ 5/56	57 50 50 10						
65°53'	70°16'	Mt. Jacklyn (Prince Charles Range)	56 57	59 15 59 08				19190	48540	Q
68°23'	70°48'	Beaver Lake	28/11/56					18261	49009	2)
76°00'	69°22'	Island Group (near Larsemann Hills)	1/11/58 7/ 2/58	06:06 66 41 07:24 66 31				18277	49030	3)
77°54'	68°33'	Magnetic Island	8/ 2/58	23:49 70 31				18022	51354	D
77°58'	68°35'	Davis						06:12	54800	4)
110°11'	66°13'	Nelly Island						07:24	17468	Q
								00:08	15960	Q
								01:33	16054	D
								12:44	15600	5)
									15634	
									16940	
								04:53	16608	6)
								06:00	16614	D
								07:16	8530	Q
								09:04	8487	Q
									05:40	
									05:49	
									05:57	
									10:11	

TABLE I - continued

Long. E	Station Lat. S	Name	Date	Declination		Horizontal Intensity		Vertical Intensity		Conditions at Mawson
				G.M.T.	Value	G.M.T.	Value	G.M.T.	Value	
111°07'	66°01'	Thompson Island	19/1/56	03:28	91°07'W	04:23	8296	02:38	68424	D
				06:12	91 28	05:46	8146	06:42	68459	D
134°22'	66°06'	Lewis Island	7/1/56	03:38	55 37	04:42	1301	02:57	69120	Q
				05:36	58 39	04:58	1358	06:32	69057	Q
			11/1/58	03:25	74 09	03:55	970	06:42	68735	Q 7)
			12/1/58	22:48	92 28	22:43	1070	22:59	68877	Q
149°48'	66°42'	Virik Bank	15/1/58	00:28	97 16	00:05	1195	00:31	68878	Q
			16/1/58	23:54	59 54	00:04	2650	23:56	68400	Q

Footnote:

- 1) = H value doubtful
- 2) = Annual mean
- 3) = Mean of first 4 months
- 4) = Z value approximate only
- 5) = Z derived from dip circle readings
- 6) = 1958 station is practical reoccupation of 1957
- 7) = 1956 and 1958 stations are in different places
- 8) = Values approximate; observations on moving ice floe

TABLE II

DECLINATION MEASUREMENTS ON ANTARCTIC TRAVERSES 1958-59

Latitude	Longitude	Date	G.M.T.	Declination	Conditions at Mawson
67°53'S	62°30'E	16 Feb. 1958	0515	59.0°W	0
67 55	62 12	8 Oct. 1958	1016	59.7	0
68 01	62 22	3 Nov. 1958	1133	57.6	0
			1311	57.6	0
68 04	62 27	14 Jan. 1959	0616	57.3	U
68 07	62 07	15 Feb. 1958	0645	59.0	U
68 14	62 42	13 Jan. 1959	0743	61.8	U
			0902	60.9	U
68 25	62 10	14 Feb. 1958	1100	59.5	U
68 33	62 06	14 Feb. 1958	0845	59.5	U
68 41	62 08	13 Feb. 1958	1440	60.0	U
68 49	62 08	9 Nov. 1958	0918	59.7	U
			0947	60.0	U
68 52	62 06	13 Feb. 1958	1214	60.0	U
68 59	62 05	13 Feb. 1958	1015	60.5	U
68 59	60 47	2 Jan. 1959	1314	62.5	U
		4 Jan. 1959	0617	61.6	U
			0805	61.3	U
69 16	62 10	12 Feb. 1958	0215	60.5	U
69 17	60 48	1 Jan. 1959	1135	60.5	U
			1206	60.6	U
69 21	62 10	11 Feb. 1958	1345	61.0	U
69 35	62 03	15 Nov. 1958	0805	61.2	U
			1044	60.6	U
			1300	60.8	U
69 38	62 10	10 Feb. 1958	1515	61.0	U
69 55	62 03	9 Feb. 1958	0510	61.5	U
70 33	62 09	9 Feb. 1958	0930	61.5	U
70 18	62 09	7 Feb. 1958	1400	61.5	U
70 26	60 50	26 Dec. 1958	1228	63.3	U
		27 Dec. 1958	0635	62.2	U
			0815	59.9	U
70 31	62 09	7 Feb. 1958	1115	62.0	U
70 49	62 09	6 Feb. 1958	1350	63.0	U
70 49	62 07	6 Dec. 1958	0957	63.4	U
			1047	63.7	U
70 50	61 38	11 Dec. 1958	1520	63.1	U
		13 Dec. 1958	1104	63.1	U
			1326	63.5	U
71 08	62 07	2 Feb. 1958	0530	62.0	U
71 22	62 07	1 Feb. 1958	1415	62.0	U
71 46	62 08	1 Feb. 1958	0700	63.0	U
72 13	62 08	28 Jan. 1958	1205	63.0	U
72 36	62 08	23 Jan. 1958	1500	63.5	U
72 51	61 21	18 Jan. 1958	0820	63.0	U

TABLE III

MISCELLANEOUS DECLINATION MEASUREMENTS BY COMPASS-THEODOLITE

Station	Latitude	Longitude	Date	G. M. T.	Declination	Conditions at Mawson
Jennings Lake	70°10'S	72°31'E	30 Oct. 1958	1227	71.3°W	Q
Beaver Lake	70 48	68 23	1 Nov. 1958	0231	67.1	Q
Grove Nunataks	72 53	74 53	9 Nov. 1958	0942	75.1	Q
Wilson Bluff	74 17	66 56	31 Oct. 1958	0720	70.8	Q

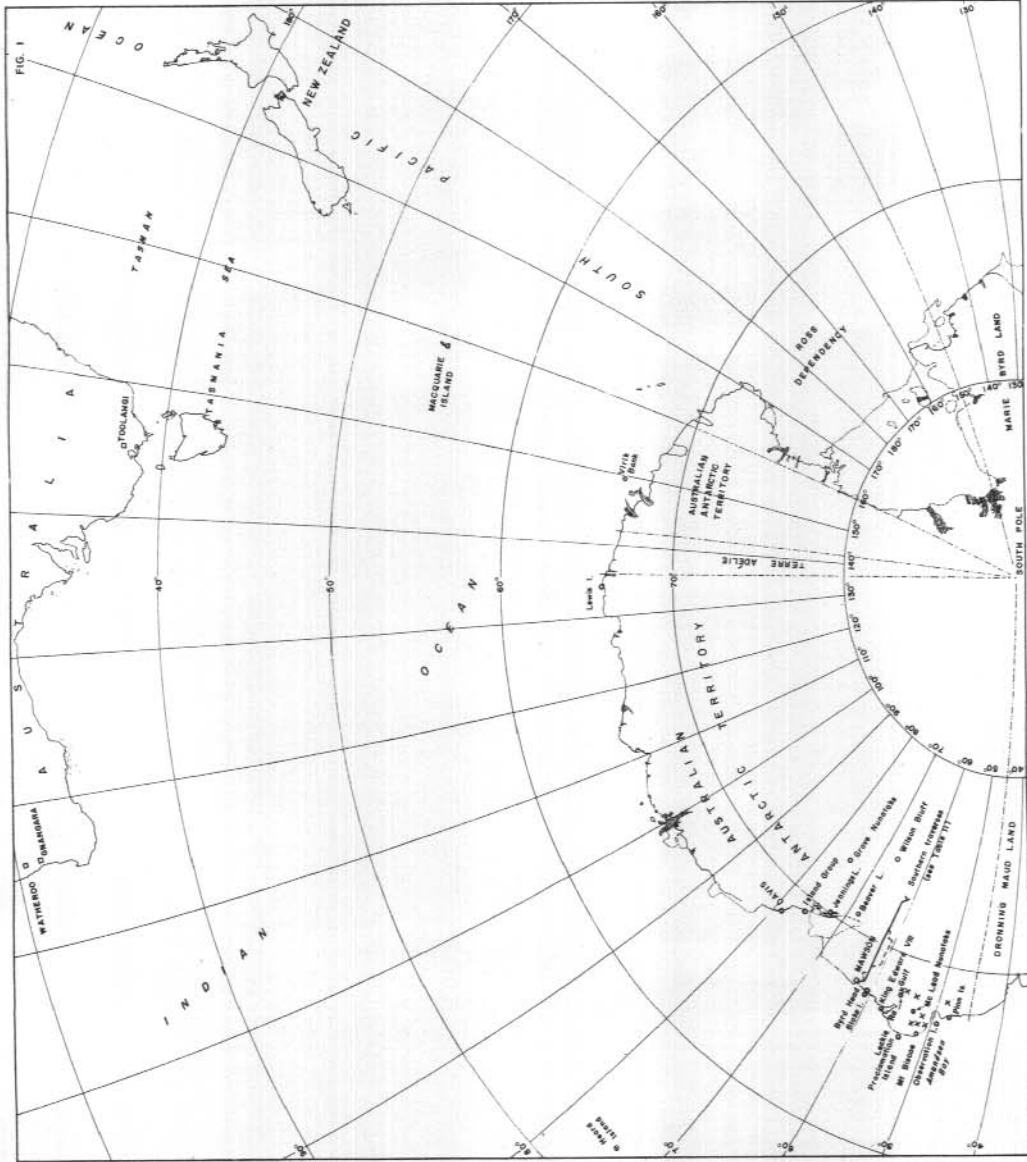


FIG. 1

**AUSTRALIAN OBSERVATORY AND
FIELD MAGNETIC STATIONS IN ANTARCTICA
DURING 1957 AND 1958**

*Geophysical Branch, Survey of Mineral Resources, Geology & Geophysics
To accompany Report No. 51.*

LEGEND

- FIELD MAGNETIC OBSERVATION
- MAGNETIC OBSERVATION
- × COMPASS OBSERVATION OF DECLINATION

SCALE IN MILES
0 100 200 300 400 500 600 700 800

