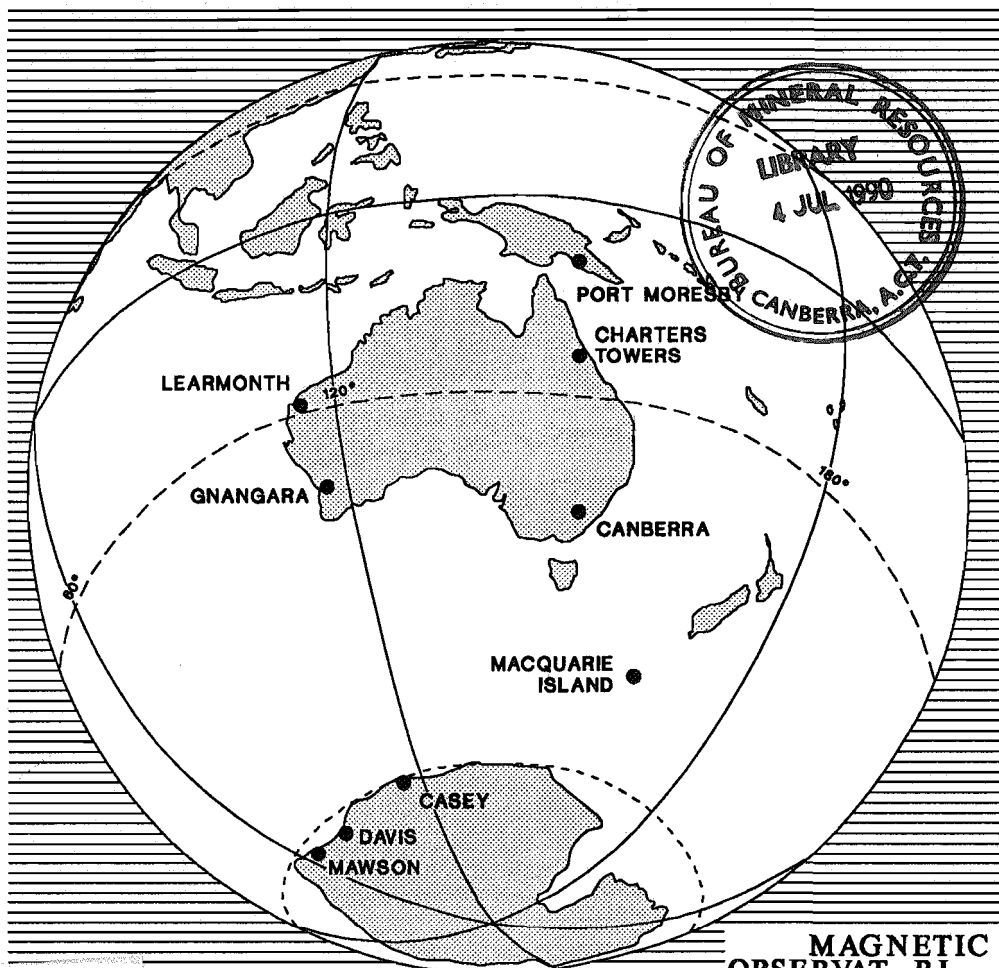


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GEOPHYSICAL OBSERVATORY REPORT



MAGNETIC
OBSERVATORIES

VOLUME 37 No.12
DECEMBER 1989

OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

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DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

Minister for Resources:

Senator the Hon. Peter Cook

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The observers at Casey, Davis and Macquarie Island are officers of the Antarctic Division, The Department of the Arts, Sport, the Environment, Tourism and Territories. Their contributions are gratefully acknowledged. These observers and the Bureau of Mineral Resources' (BMR) geophysicist at Mawson are members of the Australian National Antarctic Research Expeditions (ANARE).

Data from the Port Moresby Geophysical Observatory are contributed by the Geological Survey of Papua New Guinea.

The terminology used in this report is that accepted by the International Association of Geomagnetism and Aeronomy (IAGA). The unit of field intensity is the nanoTesla (nT). All times are in Universal Time (UT).

CONTRIBUTING OBSERVATORIES

OBSERVATORY	OBSERVER IN CHARGE	GEOGRAPHIC		GEOMAGNETIC	
		LAT.	LONG.	LAT.	LONG.
PORT MORESBY	I.D.Ripper	9° 25'S	147° 09'E	-18.1°	219.8°
CHARTERS TOWERS	J.M.Millican	20° 05'S	146° 15'E	-28.7°	220.3°
LEARMONTH	M.W.McMullan	22° 13'S	114° 06'E	-33.2°	185.5°
GNANGARA	P.J.Gregson	31° 47'S	115° 57'E	-42.7°	188.0°
CANBERRA	P.A.Hopgood	35° 19'S	149° 22'E	-43.3°	226.6°
MACQUARIE IS.	S.D.Dennis	54° 30'S	158° 57'E	-60.4°	244.7°
MAWSON	P.Crosthwaite	67° 36'S	62° 53'E	-73.2°	106.3°
DAVIS	M.Hesse	68° 35'S	77° 58'E	-76.8°	124.0°
CASEY	H.Beggs	66° 17'S	110° 32'E	-77.3°	182.7°

* Geomagnetic co-ordinates based on the 1980 DGRF Geomagnetic North pole position of 78.8°N, 70.9°W

MAGNETOGRAPHS

<u>OBSERVATORY</u>	<u>CODE</u>	<u>MODEL (TYPE/RES.)</u>	<u>ELEMENT/SCALE-VALUE</u>			
PORT MORESBY	PMG	La Cour (A)	H/3	D/5	Z/4	
CHARTERS TOWERS	CTA	EDA/Elsec (D/1)	X	Y	Z	
LEARMONTH	LRM	EDA/Elsec (D/1)	X	Y	Z	
GNANGARA	GNA	Eschenhagen(A)	H/3	D/7	Z/6	
CANBERRA	CNB	Elsec (D/.1)	D	I	F	
MACQUARIE IS.	MCQ	PEM (D/.1)	X	Y	Z	
MAWSON	MAW	PEM (D/.1)	X	Y	Z	

A = analogue, 20mm/hr, scale values in nT/mm

D/1 = digital, 1 minute readings, 1 nT resolution

D/.1 = digital, 1 minute readings, 0.1 nT resolution

PEM = BMR Photo-electronic magnetograph

MAGNETOMETERS

Absolute data are based on observations made with QHM's, BMZ's, fluxgate-theodolites, declinometers, proton vector magnetometers and proton precession magnetometers.

Errors in preliminary values obtained from magnetograms are not likely to exceed 5 nT or 0.5 minutes of arc.

PORT MORESBY

MAGNETIC K-INDICES - DECEMBER 1989

Range for lower limit of K=9 is 300nT

DAY	K-INDICES								K-SUM
01	4	5	3	3	3	5	5	4	32
02	3	4	4	3	2	2	2	4	24
03	3	3	2	3	4	4	2	3	24
04	3	3	2	3	3	3	4	3	24
05	3	4	3	2	2	1	1	2	18
06	2	1	1	2	1	1	2	1	11
07	2	2	2	1	1	2	2	3	15
08	3	2	-	-	1	1	1	3	--
09	2	1	0	-	1	1	1	1	--
10	1	1	1	0	1	0	2	2	08
11	1	3	3	2	2	2	2	2	17
12	1	2	2	2	2	2	2	3	16
13	2	1	2	1	1	1	2	1	11
14	1	1	1	4	3	3	4	3	20
15	2	2	3	2	3	1	2	2	17
16	1	3	2	3	3	4	4	3	23
17	2	2	2	3	3	3	2	2	19
18	0	1	3	3	2	2	3	2	16
19	3	2	2	1	2	2	2	2	16
20	2	2	2	1	1	1	2	3	14
21	3	2	2	1	2	2	2	2	16
22	4	4	4	5	6	4	5	3	35
23	3	5	4	4	2	3	3	3	27
24	3	2	2	3	4	4	3	3	24
25	3	3	2	3	3	1	2	3	20
26	3	3	4	3	3	3	4	4	27
27	4	3	2	3	4	3	4	3	26
28	3	3	3	2	2	1	2	3	19
29	3	3	4	5	5	5	6	6	37
30	3	3	3	3	4	3	4	4	27
31	3	5	4	5	4	4	3	3	31

Mean of K-Sum is 21.2

Frequency of K-Indices

K :	0	1	2	3	4	5	6	7	8	9	-
f :	4	41	74	78	34	11	3	0	0	0	3

GNANGARA

MAGNETIC K-INDICES - DECEMBER 1989

Range for lower limit of K=9 is 450nT

DAY	K-INDICES								K-SUM
01	4	4	3	2	4	5	6	5	33
02	4	4	4	2	2	3	2	5	26
03	4	3	4	5	4	3	2	3	28
04	4	4	2	3	2	4	4	4	27
05	4	2	1	2	1	1	2	1	14
06	2	2	1	1	1	1	1	2	11
07	3	2	2	2	2	3	3	3	20
08	1	2	2	2	3	2	2	3	17
09	2	2	0	1	1	1	1	0	08
10	1	0	0	0	0	0	2	1	04
11	1	1	2	2	3	2	1	2	14
12	1	1	2	3	3	1	2	3	16
13	2	1	2	2	2	2	1	1	13
14	1	0	1	4	3	4	3	2	18
15	3	1	3	3	3	1	2	2	18
16	1	2	2	4	4	4	3	4	24
17	3	3	2	2	3	3	1	2	19
18	0	1	2	3	2	3	3	2	16
19	3	3	1	1	2	2	2	1	15
20	2	1	2	1	1	2	2	3	14
21	4	2	2	2	2	3	2	3	20
22	5	3	3	4	5	3	5	3	31
23	3	4	4	4	3	4	1	3	26
24	2	3	2	3	4	5	4	4	27
25	3	2	2	3	3	2	2	3	20
26	3	2	3	3	3	4	5	4	27
27	4	3	3	4	4	4	4	4	30
28	4	3	3	3	2	1	1	3	20
29	4	3	3	4	4	5	6	6	35
30	5	3	4	3	4	3	4	4	30
31	3	3	4	4	4	4	3	3	28

Mean of K-Sum is 20.9

Frequency of K-Indices

K :	0	1	2	3	4	5	6	7	8	9	-
f :	9	41	67	67	50	11	3	0	0	0	0

CANBERRA

MAGNETIC K-INDICES - DECEMBER 1989

Range for lower limit of K=9 is 450nT

DAY	K-INDICES								K-SUM
01	5	4	4	3	4	5	5	5	35
02	4	5	5	2	2	2	2	4	26
03	3	5	3	4	4	4	2	3	28
04	2	3	2	3	3	4	5	3	25
05	3	3	2	2	1	1	1	2	15
06	2	1	2	2	1	1	0	1	10
07	2	3	3	1	0	2	3	2	16
08	1	2	2	1	2	2	1	3	14
09	2	1	1	1	1	1	2	1	10
10	1	1	1	0	1	0	1	1	06
11	1	2	2	3	2	2	1	1	14
12	1	2	2	1	3	1	2	3	15
13	2	1	2	1	2	1	1	0	10
14	0	0	1	4	3	3	3	3	17
15	1	1	3	3	4	0	2	2	16
16	1	1	2	3	4	4	3	3	21
17	2	2	2	3	3	3	2	1	18
18	0	1	3	3	2	2	3	2	16
19	3	2	1	1	2	2	3	3	17
20	2	2	2	1	1	2	3	4	17
21	3	2	1	1	3	3	2	2	17
22	5	5	3	4	6	3	6	3	35
23	4	5	4	4	2	3	3	4	29
24	3	3	3	3	4	4	5	4	29
25	4	5	3	3	3	2	4	4	28
26	2	2	4	3	3	3	4	4	25
27	4	3	3	3	4	4	4	2	27
28	3	3	2	1	1	1	1	3	15
29	3	2	4	4	4	5	5	5	32
30	4	3	4	3	4	4	5	4	31
31	3	4	5	4	3	3	3	2	27

Mean of K-Sum is 20.7

Frequency of K-Indices

K :	0	1	2	3	4	5	6	7	8	9	-
f :	9	50	60	67	42	18	2	0	0	0	0

MAWSON

MAGNETIC K-INDICES - DECEMBER 1989

Range for lower limit of K=9 is 1500nT

DAY	K-INDICES								K-SUM
01	6	5	5	5	5	6	6	5	43
02	5	7	6	5	3	3	5	6	40
03	4	6	5	6	5	6	6	6	44
04	5	6	5	4	5	3	5	5	38
05	6	5	5	2	2	2	4	4	30
06	3	4	3	3	4	3	3	3	26
07	4	4	5	3	4	4	4	4	32
08	3	3	3	3	4	4	2	4	26
09	5	6	5	1	3	2	2	2	26
10	3	4	3	0	1	1	2	2	16
11	3	3	3	4	4	3	3	4	27
12	4	4	3	3	4	3	3	6	30
13	5	4	3	2	4	3	3	2	26
14	2	3	3	5	4	6	4	4	31
15	6	5	4	3	3	2	3	3	29
16	5	3	4	6	6	6	4	4	38
17	5	4	4	5	4	4	3	4	33
18	4	4	3	3	3	3	4	4	28
19	4	5	4	3	3	2	3	3	27
20	4	4	3	2	3	3	3	4	26
21	5	4	4	3	4	3	4	3	30
22	4	5	5	4	6	4	6	3	37
23	4	6	6	6	5	4	4	4	39
24	5	5	5	5	5	6	6	5	42
25	5	5	6	4	4	4	4	6	38
26	5	5	5	5	4	4	6	5	39
27	5	5	5	5	6	6	5	4	41
28	4	6	3	3	3	2	3	4	28
29	4	5	5	7	6	8	8	7	50
30	5	4	6	6	6	6	6	4	43
31	6	7	6	5	5	5	4	4	42

Mean of K-Sum is 33.7

Frequency of K-Indices

K :	0	1	2	3	4	5	6	7	8	9	-
f :	1	3	16	57	70	55	40	4	2	0	0

PRINCIPAL MAGNETIC STORMS - DECEMBER 1989

OBSERVATORY	Commencement		SSC-amplitude			Max. 3hr K-index		Ranges			UT End	
	day hr min	type	D(°)	H(nT)	Z(nT)	day (3hr-period)	K	D(°)	H(nT)	Z(nT)	day hr	
Port Moresby	01 17 55	ssc*	+1.8*	+60	+57	1(6,7)	5	11	90	90	06 00	
	22 00 ..	...	..	..	..	22(5)	6	9	150	90	28 09	
	29 06 55	ssc	+1.2	+30	+30	29(7,8)	6	10	110	70	31 ..	
Gnangara	01 17 49	ssc	+12.6	+60	+73	1(7)	6	24	130	110	02 11	
	22 00 22	ssc	+1.0	+7	+4	22(1,5,7)	5	19	110	170	23 18	
	29 06 55	ssc	+2.1	+18	+13	29(7,8)	6	27	160	130	01 00	
Canberra	01 17 48	ssc	+9.4	+50	+20	1(6,7,8);2(2,3)	5	21.5	161	65	02 09	
	22 00 ..	..	..	..	..	22(5,7)	6	23.4	143	50	23 12	
	29 06 54	ssc	+1.3	+40	+5	29(6,7,8)	5	21.1	198	57	30 02	

DECEMBER 1989

PRELIMINARY MONTHLY MEAN VALUES

OBSERVATORY	H	D		Z	F
	nT	deg	min	nT	nT
PORT MORESBY	35929	06°	36.1' E	-23702	43043
CHARTERS TOWERS	31766	07°	45.8' E	-38261	49729
LEARMONTH	29505	00°	33.2' W	-44437	53340
GNANGARA	23215	03°	08.0' W	-53810	58604
CANBERRA	23673	12°	29.0' E	-53670	58659
MACQUARIE IS.	12592	29°	40.7' E	-63526	64762
MAWSON	18511	64°	13.5' W	-46069	49649
DAVIS	16772	77°	05.0' W	-51998	54636
CASEY	9722	91°	49.0' W	-63530	64270

The values are derived from magnetograms for selected quiet days except at Davis and Casey, where they are derived from semi-weekly absolute measurements.

INTERNATIONAL QUIET AND DISTURBED DAYS

Quietest days (1- 5): 10 09 06 11 19
Quietest days (6-10): 08 20 13 18 12
Most Disturbed days : 29 01 31 30 04

DECEMBER 1989

SUDDEN COMMENCEMENTS AND OTHER RAPID VARIATIONS

OBSERVATORY	DAY	TYPE AND QUALITY	TIME	SENSE AND AMPLITUDE OF CHIEF MOVEMENT		
				H(nT)	D(nT)	Z(nT)
PORT MORESBY	01	ssc*A	1755	+60	+19*	+57
	29	ssc B	0655	+30	+12	+30
GNANGARA	01	ssc A	1749	+60	+86	+73
	22	ssc B	0022	+7	+7	+4
	29	ssc B	0655	+18	+14	+13
CANBERRA	01	ssc A	1748	+50	+65	+20
	26	ssc B	0802	+32	0	0
	29	ssc B	0654	+40	+9	+5

CHANGE OF TITLE

To more accurately reflect the nature of the contents of this publication, the title will be changed to the "Australian Geomagnetism Report". This will take effect from the January 1990 issue (Vol. 39, No. 1). The new ISSN will be 1035-1515.

Preliminary Monthly Mean Values for 1989

PORT MORESBY 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	35918	06 35.8	-23724	43045	-33 26.7
February	35931	06 36.5	-23717	43053	-33 25.7
March	35901	06 35.8	-23719	43029	-33 27.1
April	35909	06 36.1	-23715	43033	-33 26.5
May	35913	06 36.3	-23714	43036	-33 26.3
June	35912	06 36.3	-23710	43033	-33 26.0
July	35927	06 36.3	-23711	43046	-33 25.4
August	35923	06 36.4	-23710	43042	-33 25.5
September	35908	06 36.5	-23713	43031	-33 26.4
October	35932	06 36.4	-23712	43051	-33 25.3
November	35906	06 36.0	-23720	43034	-33 27.0
December	35929	06 36.1	-23702	43043	-33 24.8
Annual Means	35917	06 36.2	-23714	43040	-33 26.0

CHARTERS TOWERS 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	31757	07 46.0	-38266	49727	-50 18.6
February	31755	07 46.3	-38255	49717	-50 18.3
March	31726	07 46.2	-38268	49709	-50 20.4
April	31750	07 46.6	-38264	49721	-50 18.9
May	31745	07 46.6	-38264	49718	-50 19.2
June	31744	07 46.4	-38262	49716	-50 19.2
July	31753	07 46.7	-38261	49721	-50 18.6
August	31757	07 46.5	-38257	49720	-50 18.3
September	31736	07 46.5	-38263	49712	-50 19.6
October	31760	07 46.1	-38255	49721	-50 18.0
November	31754	07 46.0	-38263	49723	-50 18.6
December	31766	07 45.8	-38261	49729	-50 18.0
Annual Means	31750	07 46.3	-38262	49720	-50 18.8

LEARMONTH 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	29477	-00 35.6	-44430	53319	-56 26.3
February	29485	-00 34.9	-44423	53317	-56 25.6
March	29449	-00 35.7	-44432	53305	-56 27.9
April	29478	-00 34.9	-44428	53318	-56 26.2
May	29469	-00 34.3	-44427	53312	-56 26.6
June	29478	-00 34.2	-44438	53326	-56 26.5
July	29483	-00 34.2	-44436	53328	-56 26.1
August	29489	-00 33.9	-44436	53331	-56 25.8
September	29474	-00 33.5	-44440	53326	-56 26.8
October	29492	-00 33.4	-44432	53329	-56 25.5
November	29491	-00 33.4	-44439	53334	-56 25.8
December	29505	-00 33.2	-44437	53340	-56 25.0
Annual Means	29481	-00 34.3	-44433	53324	-56 26.2

Preliminary Monthly Mean Values for 1989

GNANGARA 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	23204	-03 10.2	-53816	58605	-66 40.5
February	23203	-03 10.0	-53809	58599	-66 40.4
March	23187	-03 09.8	-53820	58602	-66 41.6
April	23196	-03 09.1	-53816	58602	-66 41.0
May	23181	-03 08.4	-53815	58595	-66 41.8
June	23190	-03 08.2	-53819	58603	-66 41.4
July	23203	-03 08.4	-53812	58601	-66 40.5
August	23204	-03 07.9	-53809	58599	-66 40.4
September	23183	-03 08.0	-53812	58593	-66 41.6
October	23204	-03 08.0	-53807	58597	-66 40.3
November	23199	-03 07.9	-53809	58597	-66 40.6
December	23215	-03 08.0	-53810	58604	-66 39.8
Annual Means	23197	-03 08.6	-53813	58600	-66 40.8

CANBERRA 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	23664	12 27.9	-53684	58668	-66 12.7
February	23662	12 28.7	-53682	58666	-66 12.8
March	23635	12 28.2	-53690	58662	-66 14.4
April	23655	12 29.1	-53684	58664	-66 13.2
May	23651	12 29.1	-53685	58664	-66 13.4
June	23655	12 29.2	-53684	58664	-66 13.2
July	23661	12 29.2	-53678	58662	-66 12.8
August	23662	12 29.5	-53673	58657	-66 12.6
September	23645	12 29.7	-53680	58657	-66 13.7
October	23661	12 29.6	-53670	58654	-66 12.5
November	23660	12 29.3	-53676	58659	-66 12.8
December	23673	12 29.0	-53670	58659	-66 11.9
Annual Means	23657	12 29.0	-53680	58661	-66 13.0

MACQUARIE IS. 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	12679	29 34.2	-63581	64832	-78 43.3
February	12586	29 24.0	-63586	64802	-78 48.0
March	12525	29 21.7	-63524	64747	-78 50.8
April	12577	29 30.6	-63583	64815	-78 48.7
May	12603	29 48.0	-63574	64811	-78 47.2
June	12578	29 44.0	-63567	64800	-78 48.5
July	12582	29 46.0	-63546	64780	-78 48.0
August	12578	29 41.2	-63524	64757	-78 48.0
September	12576	29 41.5	-63558	64790	-78 48.4
October	12581	29 40.9	-63525	64759	-78 47.9
November	12588	29 40.5	-63532	64767	-78 47.6
December	12592	29 40.7	-63526	64762	-78 47.3
Annual Means	12587	29 37.8	-63552	64785	-78 47.8

Preliminary Monthly Mean Values for 1989

MAWSON 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	18480	-64 08.1	-46130	49694	-68 10.1
February	18459	-64 09.7	-46120	49677	-68 11.2
March	18459	-64 10.4	-46140	49695	-68 11.7
April	18460	-64 12.2	-46132	49689	-68 11.5
May	18461	-64 13.6	-46109	49668	-68 10.8
June	18469	-64 13.6	-46098	49660	-68 09.9
July	18478	-64 13.5	-46077	49644	-68 08.9
August	18474	-64 14.6	-46077	49643	-68 09.1
September	18467	-64 16.0	-46088	49650	-68 09.9
October	18470	-64 14.4	-46075	49639	-68 09.4
November	18497	-64 14.0	-46072	49647	-68 07.5
December	18511	-64 13.5	-46069	49649	-68 06.8
Annual Means	18474	-64 12.8	-46099	49663	-68 09.7

DAVIS 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	16535	-77 08.4	-51905	54475	-72 19.8
February	16633	-77 06.8	-51983	54579	-72 15.4
March	16628	-77 15.3	-52014	54607	-72 16.3
April	16630	-77 16.2	-52015	54608	-72 16.2
May	16660	-77 14.0	-52049	54650	-72 15.0
June	16666	-77 29.3	-52061	54664	-72 14.9
July	16645	-77 14.0	-52027	54625	-72 15.5
August	17397	-77 30.0	-51732	54579	-71 24.7
September	16660	-77 17.8	-51999	54603	-72 14.1
October	16679	-77 42.0	-52039	54647	-72 13.7
November	16671	-77 00.0	-52019	54625	-72 13.8
December	16772	-77 05.0	-51998	54636	-72 07.4
Annual Means	16715	-77 16.5	-51987	54608	-72 10.6

CASEY 1989	H (nT)	D deg min	Z (nT)	F (nT)	I deg min
January	9706	-91 09.4	-63961	64694	-81 22.3
February	9732	-91 13.1	-63979	64715	-81 21.0
March	9744	-91 18.5	-63978	64716	-81 20.4
April	9655	-91 45.0	-63965	64690	-81 25.0
May	9655	-91 45.0	-63955	64681	-81 25.0
June	9650	-91 54.0	-63967	64691	-81 25.3
July	9600	-91 57.0	-63934	64651	-81 27.6
August	9600	-91 54.0	-63864	64581	-81 27.1
September	9650	-88 19.1	-63984	64708	-81 25.4
October	9699	-87 50.4	-64013	64744	-81 23.1
November	9654	-88 33.4	-63511	64240	-81 21.4
December	9722	-91 49.0	-63530	64270	-81 18.0
Annual Means	9672	-90 45.5	-63887	64615	-81 23.5

Preliminary Annual Mean Values of the Magnetic Elements 1989

OBSERVATORY	D deg min	I deg min	H (nT)	X (nT)	Y (nT)	Z (nT)	F (nT)
Port Moresby #	06 36.2 E	-33 26.0	35917	35679	4130	-23714	43040
Charters Towers	07 46.3 E	-50 18.8	31750	31459	4294	-38262	49720
Learmonth	00 34.3 W	-56 26.2	29481	29479	-294	-44433	53324
Gnangara	03 08.6 W	-66 40.8	23197	23162	-1272	-53813	58600
Canberra	12 29.0 E	-66 13.0	23657	23098	5114	-53680	58661
Macquarie Island *	29 37.8 E	-78 47.8	12587	10941	6223	-63552	64785
Mawson	64 12.8 W	-68 09.7	18474	8037	-16634	-46099	49663
Davis *	77 16.5 W	-72 10.6	16715	3681	-16304	-51987	54608
Casey *	90 45.5 W	-81 23.5	9672	-282	-9668	-63887	64615

Port Moresby results were provided by the PNG Geological Survey

* The Annual means for Casey, Davis and Macquarie Island were obtained graphically from the periodic absolute observations.

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