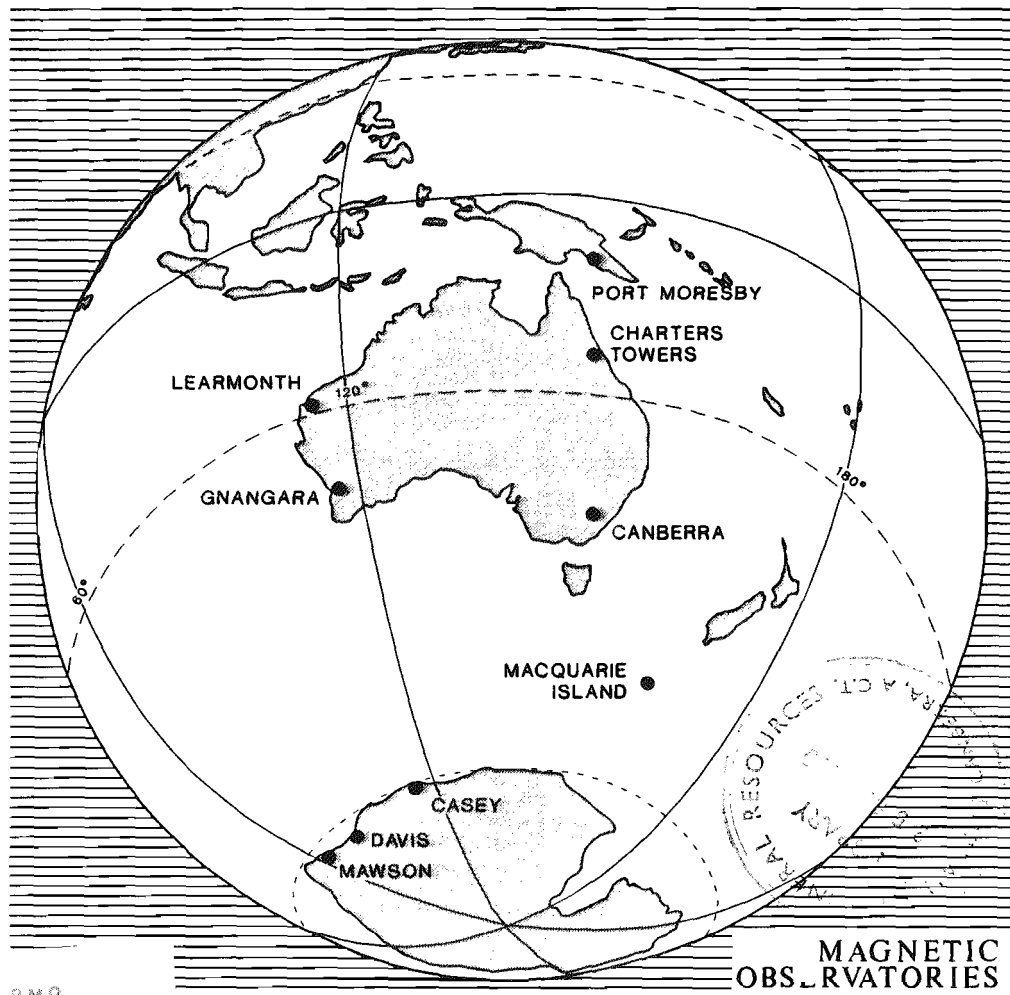




AUSTRALIAN GEOMAGNETISM REPORT



BMR
\$550
\$389.5
AUS\$
copy 2

MAGNETIC
OBSERVATORIES
VOLUME 38 No.7
JULY 1990

MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

Minister for Resources:

The Hon. Alan Griffiths MP

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

DIRECTOR:

R.W.R. Rutland AO

This report was prepared by:

**Geomagnetism Section
Division of Geophysics**

CHIEF OF DIVISION (Acting): P.L. McFadden

For further information write to:

**GEOMAGNETISM SECTION
BUREAU OF MINERAL RESOURCES
G.P.O. Box 378
CANBERRA, A.C.T., 2601
AUSTRALIA.**



Published by the B.M.R. G. & G.

ISSN 1035-1515

© Commonwealth of Australia 1990

CONTENTS

	Page
Contributing Observatories & Instrumentation ...	4
K-Indices	5
Principal Magnetic Storms	9
Monthly Mean Values	10
International Quiet & Disturbed Days	10
Sudden Commencements & other Rapid Variations .	11
Corrections to Prelim. Monthly Mean Values	11

~~~~~ \*\*\*\*\* ~~~~~

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<br>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.   | J.Rich                | 54° 30' S  | 158° 57' E | -60.4°      | 244.7° |
| MAWSON          | A.M.Lewis             | 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

| OBSERVATORY     | CODE | MODEL (TYPE/RES.) | ELEMENT/SCALE-VALUE |     |     |  |
|-----------------|------|-------------------|---------------------|-----|-----|--|
| 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 - JULY 1990**

Range for lower limit of K=9 is 300nT

| DAY | K-INDICES |   |   |   |   |   |   |   | K-SUM |
|-----|-----------|---|---|---|---|---|---|---|-------|
| 01  | 1         | 1 | 1 | 1 | 1 | 1 | 1 | 1 | 08    |
| 02  | 2         | 2 | 2 | 2 | 1 | 1 | 1 | 1 | 12    |
| 03  | 3         | 3 | 2 | 1 | 1 | 1 | 1 | 1 | 13    |
| 04  | 1         | 1 | 3 | 2 | 1 | 3 | 3 | 3 | 17    |
| 05  | 3         | 2 | 3 | 4 | 3 | 1 | 2 | 1 | 19    |
| 06  | 2         | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 11    |
| 07  | 1         | 2 | 2 | 1 | 1 | 1 | 1 | 2 | 11    |
| 08  | 1         | 3 | 3 | 2 | 1 | 2 | 2 | 2 | 16    |
| 09  | 2         | 2 | 2 | 1 | 1 | 1 | 1 | 1 | 11    |
| 10  | 2         | 4 | 3 | 2 | 4 | 2 | 2 | 2 | 21    |
| 11  | 2         | 3 | 2 | - | - | - | - | - | --    |
| 12  | -         | - | - | - | - | - | - | - | --    |
| 13  | -         | - | 3 | 3 | 1 | 2 | 2 | 2 | --    |
| 14  | 2         | 2 | 3 | 3 | 3 | 3 | 3 | 1 | 20    |
| 15  | 2         | 2 | 2 | 1 | 2 | 1 | 2 | 2 | 14    |
| 16  | 4         | 2 | 1 | 1 | 1 | 1 | 2 | 2 | 14    |
| 17  | 2         | 2 | 1 | 1 | 1 | 1 | 1 | 2 | 11    |
| 18  | 1         | 1 | 2 | 1 | 1 | 2 | 2 | 1 | 11    |
| 19  | 2         | 3 | 3 | 5 | 5 | 2 | 2 | 2 | 24    |
| 20  | 3         | 3 | 4 | 3 | 2 | 2 | 2 | 1 | 20    |
| 21  | 2         | 2 | 3 | 2 | 1 | 1 | 2 | 2 | 15    |
| 22  | 2         | 1 | 1 | 2 | 2 | 1 | 1 | 3 | 13    |
| 23  | 3         | 2 | 1 | 1 | 0 | 1 | 1 | 2 | 11    |
| 24  | 2         | 1 | 2 | 1 | 1 | 1 | 1 | 1 | 10    |
| 25  | 1         | 1 | 2 | 2 | 1 | 0 | 1 | 2 | 10    |
| 26  | 2         | 2 | 2 | 1 | 1 | 1 | 4 | 3 | 16    |
| 27  | 2         | 2 | 2 | 3 | 2 | 1 | 1 | 2 | 15    |
| 28  | 4         | 5 | 6 | 5 | 5 | 5 | 5 | 5 | 40    |
| 29  | 4         | 5 | 4 | 6 | 4 | 4 | 3 | 3 | 33    |
| 30  | 3         | 3 | 3 | 3 | 2 | 2 | 2 | 4 | 22    |
| 31  | 3         | 2 | 3 | 2 | 1 | 0 | 1 | 1 | 13    |

Mean of K-Sum is 16.1

**Frequency of K-Indices**

|     |   |    |    |    |    |   |   |   |   |   |    |
|-----|---|----|----|----|----|---|---|---|---|---|----|
| K : | 0 | 1  | 2  | 3  | 4  | 5 | 6 | 7 | 8 | 9 | -  |
| f : | 3 | 86 | 83 | 38 | 12 | 9 | 2 | 0 | 0 | 0 | 15 |

GNANGARA

MAGNETIC K-INDICES - JULY 1990

Range for lower limit of K=9 is 450nT

| DAY | K-INDICES |   |   |   |   |   |   |   | K-SUM |
|-----|-----------|---|---|---|---|---|---|---|-------|
| 01  | 1         | 1 | 0 | 0 | 0 | 1 | 0 | 2 | 05    |
| 02  | 2         | 2 | 1 | 0 | 1 | 2 | 1 | 0 | 09    |
| 03  | 2         | 2 | 2 | 1 | 1 | 0 | 1 | 1 | 10    |
| 04  | 1         | 1 | 1 | 1 | 1 | 3 | 3 | 3 | 14    |
| 05  | 2         | 2 | 1 | 3 | 3 | 2 | 2 | 2 | 17    |
| 06  | 1         | 1 | 0 | 0 | 1 | 2 | 3 | 2 | 10    |
| 07  | 1         | 1 | 1 | 0 | 1 | 1 | 2 | 3 | 10    |
| 08  | 1         | 3 | 2 | 2 | 2 | 3 | 3 | 2 | 18    |
| 09  | 1         | 2 | 2 | 1 | 1 | 0 | 1 | 0 | 08    |
| 10  | 1         | 3 | 3 | 2 | 3 | 1 | 1 | 1 | 15    |
| 11  | 2         | 2 | 2 | 1 | 3 | 1 | 3 | 1 | 15    |
| 12  | 2         | 3 | 3 | 2 | 2 | 0 | 2 | 2 | 16    |
| 13  | 3         | 3 | 3 | 3 | 1 | 1 | 3 | 2 | 19    |
| 14  | 2         | 2 | 2 | 2 | 3 | 2 | 4 | 2 | 19    |
| 15  | 2         | 2 | 3 | 1 | 2 | 1 | 3 | 2 | 16    |
| 16  | 2         | 2 | 2 | 1 | 0 | 1 | 1 | 1 | 10    |
| 17  | 1         | 2 | 1 | 0 | 0 | 0 | 2 | 2 | 08    |
| 18  | 2         | 1 | 2 | 0 | 0 | 3 | 3 | 1 | 12    |
| 19  | 1         | 2 | 2 | 4 | 4 | 2 | 2 | 2 | 19    |
| 20  | 2         | 2 | 3 | 2 | 4 | 1 | 3 | 2 | 19    |
| 21  | 1         | 2 | 1 | 1 | 1 | 2 | 2 | 1 | 11    |
| 22  | 1         | 2 | 2 | 0 | 3 | 1 | 1 | 2 | 12    |
| 23  | 1         | 2 | 1 | 0 | 0 | 2 | 1 | 2 | 09    |
| 24  | 1         | 2 | 0 | 1 | 0 | 0 | 1 | 0 | 05    |
| 25  | 1         | 1 | 1 | 1 | 0 | 1 | 0 | 0 | 05    |
| 26  | 0         | 0 | 1 | 0 | 0 | 1 | 4 | 3 | 09    |
| 27  | 1         | 3 | 2 | 1 | 1 | 2 | 3 | 2 | 15    |
| 28  | 4         | 4 | 5 | 5 | 6 | 6 | 5 | 6 | 41    |
| 29  | 6         | 5 | 4 | 6 | 5 | 4 | 3 | 3 | 36    |
| 30  | 1         | 1 | 2 | 2 | 1 | 1 | 1 | 2 | 11    |
| 31  | 2         | 2 | 2 | 1 | 1 | 0 | 0 | 0 | 08    |

Mean of K-Sum is 13.9

Frequency of K-Indices

|     |    |    |    |    |   |   |   |   |   |   |   |
|-----|----|----|----|----|---|---|---|---|---|---|---|
| K : | 0  | 1  | 2  | 3  | 4 | 5 | 6 | 7 | 8 | 9 | - |
| f : | 36 | 81 | 77 | 35 | 9 | 5 | 5 | 0 | 0 | 0 | 0 |

CANBERRA

MAGNETIC K-INDICES - JULY 1990

Range for lower limit of K=9 is 450nT

| DAY | K-INDICES |   |   |   |   |   |   |   | K-SUM |
|-----|-----------|---|---|---|---|---|---|---|-------|
| 01  | 1         | 1 | 1 | 1 | 0 | 1 | 0 | 1 | 06    |
| 02  | 2         | 2 | 2 | 0 | 0 | 1 | 0 | 0 | 07    |
| 03  | 1         | 2 | 1 | 0 | 0 | 1 | 0 | 0 | 05    |
| 04  | 0         | 0 | 1 | 1 | 0 | 3 | 2 | 2 | 09    |
| 05  | 2         | 2 | 1 | 3 | 2 | 2 | 1 | 1 | 14    |
| 06  | 2         | 1 | 0 | 0 | 0 | 1 | 2 | 1 | 07    |
| 07  | 1         | 1 | 0 | 0 | 1 | 1 | 1 | 2 | 07    |
| 08  | 1         | 1 | 2 | 2 | 1 | 3 | 2 | 1 | 13    |
| 09  | 0         | 1 | 0 | 0 | 1 | 0 | 0 | 0 | 02    |
| 10  | 1         | 4 | 2 | 2 | 3 | 1 | 0 | 1 | 14    |
| 11  | 1         | 2 | 2 | 1 | 2 | 1 | 2 | 0 | 11    |
| 12  | 1         | 2 | 2 | 2 | 0 | 0 | 1 | 1 | 09    |
| 13  | 2         | 2 | 3 | 3 | 0 | 1 | 3 | 0 | 14    |
| 14  | 2         | 0 | 1 | 3 | 3 | 2 | 3 | 2 | 16    |
| 15  | 1         | 3 | 2 | 1 | 2 | 1 | 2 | 1 | 13    |
| 16  | 2         | 2 | 0 | 0 | 0 | 0 | 1 | 1 | 06    |
| 17  | 1         | 1 | 1 | 0 | 0 | 0 | 0 | 1 | 04    |
| 18  | 1         | 1 | 1 | 0 | 0 | 2 | 3 | 1 | 09    |
| 19  | 2         | 3 | 2 | 4 | 4 | 2 | 2 | 2 | 21    |
| 20  | 2         | 3 | 4 | 3 | 3 | 2 | 2 | 1 | 20    |
| 21  | 1         | 1 | 0 | 2 | 1 | 1 | 2 | 0 | 08    |
| 22  | 1         | 1 | 1 | 1 | 2 | 1 | 0 | 1 | 08    |
| 23  | 1         | 1 | 0 | 0 | 0 | 2 | 0 | 1 | 05    |
| 24  | 2         | 2 | 1 | 1 | 0 | 0 | 0 | 0 | 06    |
| 25  | 0         | 1 | 2 | 1 | 1 | 0 | 0 | 0 | 05    |
| 26  | 0         | 0 | 1 | 0 | 0 | 1 | 3 | 3 | 08    |
| 27  | 1         | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 14    |
| 28  | 2         | 4 | 6 | 5 | 6 | 6 | 5 | 6 | 40    |
| 29  | 4         | 5 | 5 | 6 | 4 | 3 | 2 | 3 | 32    |
| 30  | 2         | 2 | 3 | 3 | 1 | 1 | 1 | 4 | 17    |
| 31  | 1         | 0 | 2 | 1 | 0 | 0 | 0 | 1 | 05    |

Mean of K-Sum is 11.5

Frequency of K-Indices

|     |    |    |    |    |   |   |   |   |   |   |   |
|-----|----|----|----|----|---|---|---|---|---|---|---|
| K : | 0  | 1  | 2  | 3  | 4 | 5 | 6 | 7 | 8 | 9 | - |
| f : | 64 | 83 | 62 | 22 | 8 | 4 | 5 | 0 | 0 | 0 | 0 |

**MAWSON****MAGNETIC K-INDICES - JULY 1990**

Range for lower limit of K=9 is 1500nT

| DAY | K-INDICES |   |   |   |   |   |   |   | K-SUM |
|-----|-----------|---|---|---|---|---|---|---|-------|
| 01  | 2         | 3 | 2 | 2 | 1 | 0 | 3 | 6 | 19    |
| 02  | 5         | 4 | 4 | 3 | 2 | 1 | 0 | 0 | 19    |
| 03  | 1         | 5 | 5 | 2 | 1 | 1 | 1 | 1 | 17    |
| 04  | 3         | 2 | 2 | 1 | 0 | 2 | 3 | 5 | 18    |
| 05  | 3         | 4 | 3 | 2 | 4 | 3 | 4 | 4 | 27    |
| 06  | 3         | 3 | 2 | 1 | 1 | 3 | 3 | 4 | 20    |
| 07  | 2         | 3 | 3 | 1 | 0 | 0 | 3 | 6 | 18    |
| 08  | 3         | 5 | 4 | 3 | 3 | 4 | 5 | 5 | 32    |
| 09  | 4         | 4 | 2 | 1 | 1 | 0 | 1 | 3 | 16    |
| 10  | 3         | 5 | 5 | 2 | 2 | 1 | 0 | 2 | 20    |
| 11  | 3         | 3 | 2 | 1 | 1 | 1 | 4 | 3 | 18    |
| 12  | 3         | 5 | 5 | 3 | 3 | 1 | 2 | 5 | 27    |
| 13  | 6         | 6 | 4 | 3 | 2 | 3 | 5 | 4 | 33    |
| 14  | 4         | 1 | 1 | 1 | 3 | 3 | 6 | 6 | 25    |
| 15  | 4         | 5 | 5 | 3 | 1 | 1 | 4 | 4 | 27    |
| 16  | 4         | 4 | 2 | 1 | 1 | 1 | 3 | 2 | 18    |
| 17  | 1         | 4 | 4 | 1 | 2 | 1 | 2 | 4 | 19    |
| 18  | 5         | 3 | 3 | 2 | 1 | 3 | 3 | 3 | 23    |
| 19  | 2         | 4 | 4 | 3 | 4 | 3 | 5 | 3 | 28    |
| 20  | 4         | 5 | 5 | 4 | 3 | 3 | 4 | 3 | 31    |
| 21  | 2         | 3 | 3 | 2 | 3 | 3 | 6 | 3 | 25    |
| 22  | 4         | 4 | 3 | 1 | 2 | 2 | 2 | 5 | 23    |
| 23  | 3         | 3 | 2 | 3 | 0 | 2 | 3 | 5 | 21    |
| 24  | 2         | 4 | 4 | 2 | 1 | 1 | 3 | 2 | 19    |
| 25  | 3         | 3 | 2 | 2 | 2 | 1 | 1 | 2 | 16    |
| 26  | 1         | 1 | 1 | 1 | 0 | 1 | 2 | 5 | 12    |
| 27  | 2         | 3 | 3 | 3 | 2 | 1 | 4 | 4 | 22    |
| 28  | 4         | 5 | 6 | 5 | 5 | 6 | 8 | 7 | 46    |
| 29  | 8         | 7 | 4 | 5 | 6 | 4 | 5 | 6 | 45    |
| 30  | 2         | 4 | 5 | 3 | 2 | 3 | 2 | 5 | 26    |
| 31  | 5         | 3 | 4 | 3 | 1 | 0 | 0 | 2 | 18    |

Mean of K-Sum is 23.5

**Frequency of K-Indices**

|     |    |    |    |    |    |    |    |   |   |   |   |
|-----|----|----|----|----|----|----|----|---|---|---|---|
| K : | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7 | 8 | 9 | - |
| f : | 12 | 43 | 45 | 63 | 40 | 30 | 11 | 2 | 2 | 0 | 0 |

PRINCIPAL MAGNETIC STORMS - JULY 1990

| 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 | 19           | 01 | ..            | ...  | ..    | ..               | ..    | 19(4,5)                | 5 | 4    | 130    | 70    | 19  | 20 |
|              | 28           | 03 | 30            | ssc* | +0.8* | +47*             | +46*  | 28(3);29(4)            | 6 | 10   | 300    | 130   | 30  | 15 |
| Gnangara     | 28           | 03 | 31            | ssc* | -4.4* | +18              | -16*  | 28(5,6,8);<br>29(1,4). | 6 | 27   | 170    | 160   | 30  | 00 |
| Canberra     | 28           | 03 | 30            | ssc* | +2.2  | +40*             | +10   | 28(3,5,6,8);<br>29(4). | 6 | 33.3 | 275    | 95    | 29  | 23 |

**JULY 1990**

**PRELIMINARY MONTHLY MEAN VALUES**

| <b>OBSERVATORY</b> | <b>H</b>  | <b>D</b>   |            | <b>Z</b>  | <b>F</b>  |
|--------------------|-----------|------------|------------|-----------|-----------|
|                    | <b>nT</b> | <b>deg</b> | <b>min</b> | <b>nT</b> | <b>nT</b> |
| PORT MORESBY       | 35930     | 06°        | 36.1' E    | -23709    | 43047     |
| CHARTERS TOWERS    | 31751     | 07°        | 47.3' E    | -38255    | 49715     |
| LEARMONTH          | 29496     | 00°        | 32.9' W    | -44413    | 53315     |
| GNANGARA           | 23199     | 03°        | 05.7' W    | -53796    | 58585     |
| CANBERRA           | 23656     | 12°        | 30.8' E    | -53659    | 58642     |
| MACQUARIE IS.      | 12570     | 29°        | 43.4' E    | -63505    | 64738     |
| MAWSON             | 18485     | 64°        | 22.0' W    | -46002    | 49577     |
| DAVIS              | 16660     | 77°        | 27.0' W    | -51986    | 54590     |
| CASEY              | 9620      | 92°        | 06.0' W    | -63505    | 64230     |

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): 25 24 23 09 01  
Quietest days (6-10): 17 22 07 31 02  
Most Disturbed days : 28 29 20 19 10

JULY 1990

SUDDEN COMMENCEMENTS AND OTHER RAPID VARIATIONS

| OBSERVATORY  | DAY | TYPE AND<br>QUALITY | TIME | SENSE AND AMPLITUDE<br>OF CHIEF MOVEMENT |       |       |
|--------------|-----|---------------------|------|------------------------------------------|-------|-------|
|              |     |                     |      | H(nT)                                    | D(nT) | Z(nT) |
| PORT MORESBY | 10  | SSC*B               | 0445 | +22*                                     | +3*   | +16   |
|              | 28  | SSC*B               | 0107 | +24*                                     | -3    | +22*  |
|              | 28  | SSC*B               | 0330 | +47*                                     | +8*   | +46*  |
| GNANGARA     | 10  | SSC*B               | 0446 | +18*                                     | +5*   | +5*   |
|              | 28  | SSC*B               | 0331 | +18                                      | -30*  | -16*  |
| CANBERRA     | 10  | SSC*A               | 0445 | +35*                                     | +17*  | +5*   |
|              | 28  | SSC*A               | 0330 | +40*                                     | +15*  | +10   |

---

Preliminary Monthly Mean Values of the Declination  
angle for CASEY in the May and June reports should  
read 92°15.0' W and 92°06.0' W respectively.

