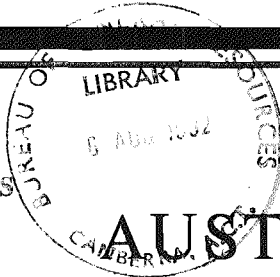
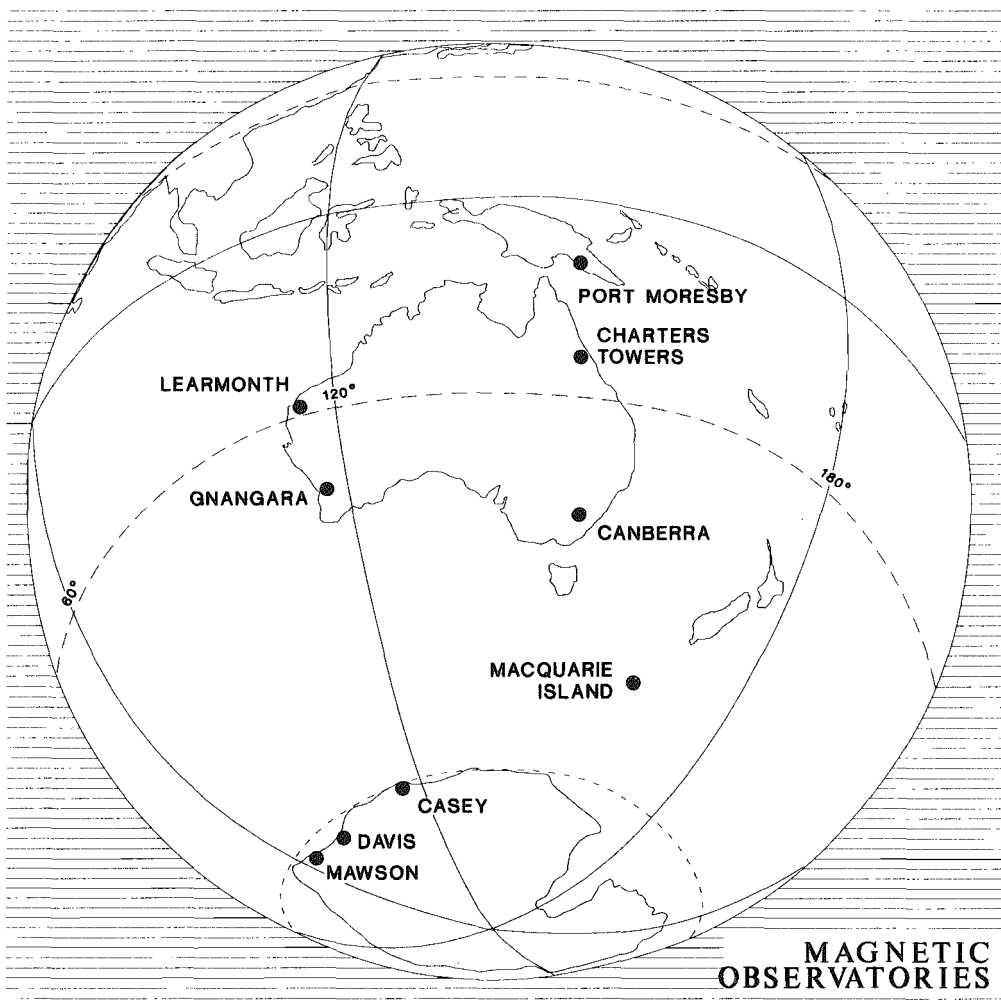


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MAGNETIC
OBSERVATORIES

VOLUME 40 No.5

MAY 1992

BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

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DEPARTMENT OF PRIMARY INDUSTRIES AND ENERGY

Minister for Resources:

The Hon. Alan Griffiths MP

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

EXECUTIVE DIRECTOR:

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The observers at Casey, Davis and Macquarie Island are officers of the Antarctic Division, of the Department of the Arts, Sport, the Environment & 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 Expedition (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.   | R. Jones              | 54° 30'S   | 158° 57'E | -60.4°      | 244.7° |   |
| MAWSON          | J.L.Jamieson          | 67° 36'S   | 62° 53'E  | -73.2°      | 106.3° |   |
| DAVIS           | D. Neudegg            | 68° 35'S   | 77° 58'E  | -76.8°      | 124.0° |   |
| CASEY           | N. Mifsud             | 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         | Elsec                    | (D/.1) | D                          | I   | F   |
| 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 - MAY 1992**

Range for lower limit of K=9 is 300nT

| DAY | K-INDICES |   |   |   |   |   |   |   | K-SUM |
|-----|-----------|---|---|---|---|---|---|---|-------|
| 01  | 2         | 3 | 4 | 2 | 2 | 3 | 5 | 2 | 23    |
| 02  | 2         | 4 | 4 | 2 | 1 | 2 | 2 | 2 | 19    |
| 03  | 3         | 2 | 2 | 2 | 2 | 1 | 2 | 2 | 16    |
| 04  | 3         | 2 | 2 | 3 | 2 | 2 | 1 | 2 | 17    |
| 05  | 1         | 2 | 2 | 2 | 3 | 2 | 2 | 3 | 17    |
| 06  | 2         | 1 | 2 | 1 | 1 | 1 | 2 | 3 | 13    |
| 07  | 2         | 2 | 3 | 3 | 4 | 3 | 3 | 3 | 23    |
| 08  | 2         | 2 | 4 | 4 | 4 | 3 | 4 | 3 | 26    |
| 09  | 2         | 2 | 4 | 4 | 4 | 4 | 6 | 5 | 31    |
| 10  | 5         | 6 | 8 | 7 | 7 | 7 | 5 | 4 | 49    |
| 11  | 4         | 4 | 5 | 4 | 4 | 4 | 3 | 2 | 30    |
| 12  | 3         | 4 | 2 | 2 | 3 | 2 | 2 | 1 | 19    |
| 13  | 3         | 4 | 3 | 3 | 4 | 3 | 3 | 2 | 25    |
| 14  | 2         | 2 | 1 | 1 | 0 | 0 | 0 | 1 | 07    |
| 15  | 1         | 1 | 1 | 2 | 1 | 1 | 1 | 1 | 09    |
| 16  | 1         | 1 | 1 | 1 | 1 | 1 | 1 | 0 | 07    |
| 17  | 1         | 1 | 1 | 1 | 0 | 0 | 1 | 2 | 07    |
| 18  | 1         | 1 | 2 | 2 | 2 | 2 | 4 | 4 | 18    |
| 19  | 3         | 2 | 2 | 2 | 1 | 2 | 2 | 2 | 16    |
| 20  | 2         | 2 | 2 | 2 | 2 | 2 | 2 | 3 | 17    |
| 21  | 2         | 1 | 2 | 2 | 1 | 1 | 2 | 2 | 13    |
| 22  | 2         | 5 | 6 | 5 | 4 | 4 | 4 | 2 | 32    |
| 23  | 3         | 3 | 3 | 1 | 2 | 3 | 4 | 2 | 21    |
| 24  | 3         | 3 | 3 | 1 | 1 | 1 | 1 | 2 | 15    |
| 25  | 2         | 2 | 3 | 2 | 2 | 2 | 3 | 2 | 18    |
| 26  | 1         | 2 | 3 | 3 | 2 | 1 | 2 | 2 | 16    |
| 27  | 3         | 2 | 3 | 3 | 3 | 2 | 2 | 1 | 19    |
| 28  | 2         | 2 | 3 | 3 | 2 | 2 | 2 | 2 | 18    |
| 29  | 3         | 4 | 4 | 2 | 3 | 3 | 3 | 3 | 25    |
| 30  | 2         | 2 | 2 | 2 | 3 | 2 | 2 | 2 | 17    |
| 31  | 2         | 3 | 2 | 2 | 1 | 3 | 2 | 1 | 16    |

**Mean of K-Sum is 19.3**

**Frequency of K-Indices**

|            |   |    |     |    |    |   |   |   |   |   |   |
|------------|---|----|-----|----|----|---|---|---|---|---|---|
| <b>K :</b> | 0 | 1  | 2   | 3  | 4  | 5 | 6 | 7 | 8 | 9 | - |
| <b>f :</b> | 6 | 47 | 102 | 50 | 29 | 7 | 3 | 3 | 1 | 0 | 0 |

**GNANGARA**

**MAGNETIC K-INDICES - MAY 1992**

Range for lower limit of K=9 is 450nT

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

Mean of K-Sum is 16.7

**Frequency of K-Indices**

|     |    |    |    |    |    |    |   |   |   |   |   |
|-----|----|----|----|----|----|----|---|---|---|---|---|
| K : | 0  | 1  | 2  | 3  | 4  | 5  | 6 | 7 | 8 | 9 | - |
| f : | 26 | 85 | 52 | 47 | 15 | 15 | 5 | 2 | 1 | 0 | 0 |

CANBERRA

**MAGNETIC K-INDICES - MAY 1992**

Range for lower limit of K=9 is 450nT

| DAY | K-INDICES |   |   |   |   |   |   |   | K-SUM |
|-----|-----------|---|---|---|---|---|---|---|-------|
| 01  | 1         | 3 | 3 | 1 | 1 | 2 | 3 | 2 | 16    |
| 02  | 1         | 3 | 4 | 1 | 1 | 1 | 1 | 1 | 13    |
| 03  | 2         | 2 | 2 | 2 | 2 | 2 | 2 | 1 | 15    |
| 04  | 1         | 3 | 1 | 4 | 2 | 3 | 1 | 1 | 16    |
| 05  | 1         | 3 | 0 | 1 | 3 | 1 | 1 | 1 | 11    |
| 06  | 0         | 0 | 1 | 1 | 0 | 1 | 1 | 1 | 05    |
| 07  | 2         | 2 | 2 | 1 | 3 | 2 | 3 | 2 | 17    |
| 08  | 1         | 2 | 4 | 6 | 4 | 3 | 4 | 2 | 26    |
| 09  | 2         | 1 | 0 | 2 | 3 | 3 | 5 | 5 | 21    |
| 10  | 4         | 5 | 7 | 7 | 7 | 7 | 6 | 5 | 48    |
| 11  | 4         | 4 | 5 | 5 | 4 | 5 | 3 | 3 | 33    |
| 12  | 2         | 2 | 2 | 1 | 3 | 2 | 3 | 1 | 16    |
| 13  | 2         | 3 | 3 | 4 | 4 | 2 | 2 | 2 | 22    |
| 14  | 1         | 1 | 0 | 0 | 0 | 0 | 0 | 1 | 03    |
| 15  | 1         | 1 | 0 | 2 | 0 | 1 | 1 | 1 | 07    |
| 16  | 0         | 0 | 0 | 1 | 1 | 0 | 0 | 0 | 02    |
| 17  | 0         | 0 | 0 | 0 | 0 | 0 | 0 | 1 | 01    |
| 18  | 1         | 0 | 0 | 1 | 2 | 1 | 3 | 4 | 12    |
| 19  | 3         | 2 | 1 | 2 | 2 | 2 | 1 | 2 | 15    |
| 20  | 2         | 1 | 0 | 0 | 2 | 1 | 1 | 2 | 09    |
| 21  | 1         | 0 | 1 | 3 | 1 | 1 | 1 | 2 | 10    |
| 22  | 1         | 4 | 4 | 4 | 4 | 3 | 3 | 2 | 25    |
| 23  | 2         | 2 | 2 | 0 | 1 | 3 | 3 | 2 | 15    |
| 24  | 2         | 2 | 2 | 1 | 0 | 1 | 0 | 1 | 09    |
| 25  | 0         | 2 | 3 | 3 | 2 | 2 | 2 | 1 | 15    |
| 26  | 0         | 0 | 1 | 1 | 1 | 1 | 1 | 2 | 07    |
| 27  | 1         | 1 | 3 | 3 | 3 | 3 | 1 | 1 | 16    |
| 28  | 2         | 1 | 3 | 4 | 2 | 2 | 1 | 2 | 17    |
| 29  | 2         | 2 | 4 | 2 | 4 | 3 | 2 | 2 | 21    |
| 30  | 2         | 2 | 3 | 3 | 4 | 2 | 2 | 1 | 19    |
| 31  | 2         | 3 | 2 | 1 | 1 | 3 | 1 | 1 | 14    |

Mean of K-Sum is 15.4

**Frequency of K-Indices**

|     |    |    |    |    |    |   |   |   |   |   |   |
|-----|----|----|----|----|----|---|---|---|---|---|---|
| K : | 0  | 1  | 2  | 3  | 4  | 5 | 6 | 7 | 8 | 9 | - |
| f : | 36 | 75 | 66 | 38 | 20 | 7 | 2 | 4 | 0 | 0 | 0 |

**MAWSON**

**MAGNETIC K-INDICES - MAY 1992**

Range for lower limit of K=9 is 1500nT

| DAY | K-INDICES |   |   |   |   |   |   |   | K-SUM |
|-----|-----------|---|---|---|---|---|---|---|-------|
| 01  | 3         | 3 | 5 | 3 | 3 | 3 | 7 | 3 | 30    |
| 02  | 3         | 5 | 5 | 2 | 1 | 2 | 3 | 2 | 23    |
| 03  | 3         | 3 | 2 | 2 | 3 | 3 | 4 | 4 | 24    |
| 04  | 5         | 5 | 4 | 2 | 4 | 3 | 1 | 2 | 26    |
| 05  | 2         | 3 | 1 | 2 | 1 | 1 | 0 | 1 | 11    |
| 06  | 1         | 1 | 2 | 2 | 1 | 0 | 1 | 1 | 09    |
| 07  | 3         | 3 | 2 | 2 | 2 | 4 | 6 | 7 | 29    |
| 08  | 5         | 6 | 6 | 3 | 3 | 5 | 6 | 5 | 39    |
| 09  | 4         | 3 | 3 | 2 | 3 | 5 | 8 | 7 | 35    |
| 10  | 6         | 6 | 8 | 6 | 5 | 6 | 6 | 8 | 51    |
| 11  | 8         | 7 | 4 | 5 | 6 | 7 | 7 | 6 | 50    |
| 12  | 6         | 6 | 3 | 3 | 4 | 3 | 6 | 4 | 35    |
| 13  | 5         | 6 | 5 | 4 | 4 | 3 | 4 | 5 | 36    |
| 14  | 4         | 3 | 2 | 2 | 1 | 0 | 0 | 0 | 12    |
| 15  | 1         | 2 | 1 | 2 | 2 | 3 | 3 | 2 | 16    |
| 16  | 1         | 1 | 2 | 1 | 1 | 0 | 0 | 2 | 08    |
| 17  | 1         | 0 | 1 | 1 | 0 | 0 | 1 | 4 | 08    |
| 18  | 5         | 3 | 2 | 1 | 2 | 2 | 3 | 7 | 25    |
| 19  | 6         | 6 | 3 | 1 | 2 | 5 | 5 | 3 | 31    |
| 20  | 5         | 4 | 3 | 3 | 2 | 1 | 4 | 5 | 27    |
| 21  | 5         | 2 | 3 | 2 | 1 | 2 | 6 | 6 | 27    |
| 22  | 4         | 5 | 5 | 5 | 5 | 4 | 5 | 4 | 37    |
| 23  | 3         | 3 | 3 | 2 | 1 | 4 | 7 | 3 | 26    |
| 24  | 5         | 5 | 4 | 3 | 1 | 1 | 1 | 2 | 22    |
| 25  | 4         | 4 | 3 | 3 | 2 | 3 | 5 | 4 | 28    |
| 26  | 2         | 1 | 2 | 2 | 3 | 1 | 3 | 6 | 20    |
| 27  | 3         | 4 | 3 | 4 | 4 | 3 | 2 | 3 | 26    |
| 28  | 4         | 4 | 5 | 3 | 3 | 3 | 2 | 4 | 28    |
| 29  | 2         | 5 | 6 | 3 | 4 | 3 | 6 | 5 | 34    |
| 30  | 3         | 4 | 5 | 4 | 3 | 4 | 5 | 6 | 34    |
| 31  | 7         | 5 | 4 | 3 | 2 | 3 | 2 | 1 | 27    |

Mean of K-Sum is 26.9

**Frequency of K-Indices**

|            |    |    |    |    |    |    |    |   |   |   |   |
|------------|----|----|----|----|----|----|----|---|---|---|---|
| <b>K :</b> | 0  | 1  | 2  | 3  | 4  | 5  | 6  | 7 | 8 | 9 | - |
| <b>f :</b> | 10 | 33 | 42 | 58 | 35 | 34 | 23 | 9 | 4 | 0 | 0 |

PRINCIPAL MAGNETIC STORMS - MAY 1992

| 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 | 09 19 57     | ssc  | +2.0          | +90   | +83   | 10(3)            | 8 | 11     | 500   | 190   | 12 06  |
|              | 22 04 ..     | ...  | ..            | ..    | ..    | 22(3)            | 6 | 5      | 160   | 60    | 22 21  |
| Gnangara     | 09 19 57     | ssc  | -12.7         | +97   | -71   | 10(5)            | 8 | 59     | 430   | 410   | 11 22  |
| Canberra     | 09 19 58     | ssc* | +9.7*         | +83   | -24*  | 10(3-6)          | 7 | 50.5   | 445   | 194   | 11 21  |

MAY 1992

PRELIMINARY MONTHLY MEAN VALUES

| OBSERVATORY     | H     | D   |       |   | Z      | F     |
|-----------------|-------|-----|-------|---|--------|-------|
|                 | nT    | deg | min   |   | nT     | nT    |
| PORT MORESBY    | 35911 | 06° | 35.9' | E | -23673 | 43012 |
| CHARTERS TOWERS | 31729 | 07° | 47.8' | E | -38226 | 49678 |
| LEARMONTH       | 29530 | 00° | 23.8' | W | -44408 | 53330 |
| GNANGARA        | 23176 | 02° | 58.9' | W | -53776 | 58558 |
| CANBERRA        | 23636 | 12° | 32.2' | E | -53629 | 58607 |
| MACQUARIE IS.   | 12565 | 29° | 53.1' | E | -63460 | 64692 |
| MAWSON          | 18509 | 64° | 35.1' | W | -45897 | 49489 |
| DAVIS           | 16676 | 78° | 02.7' | W | -51869 | 54484 |
| CASEY           | 9626  | 92° | 15.9' | W | -63864 | 64585 |

The values are derived from magnetograms over the Quietest 5 International Days, except at Mawson, Davis and Casey, where the locally quietest days are used.

INTERNATIONAL QUIET AND DISTURBED DAYS

Quietest days (1- 5): 17 16 14 15 06  
 Quietest days (6-10): 05 26 31 21 20  
 Most Disturbed days : 10 11 22 09 08

SUDDEN STORM COMMENCEMENTS (ssc): MAY 1992

| Observatory  | Day | Type<br>and<br>Quality | U.T. | Sense and Amplitude<br>of Chief Movement |       |       |
|--------------|-----|------------------------|------|------------------------------------------|-------|-------|
|              |     |                        |      | H(nT)                                    | D(nT) | Z(nT) |
| PORT MORESBY | 09  | ssc A                  | 1957 | +90                                      | +21   | +83   |
| GNANGARA     | 09  | ssc A                  | 1957 | +97                                      | -86   | -71   |
| CANBERRA     | 09  | ssc*A                  | 1958 | +83                                      | +67*  | -24*  |

SOLAR FLARE EFFECTS (sfe): MAY 1992

| Observatory  | ----- U.T. of sfe ----- |       |      |       | Con-<br>fir-<br>med. | Sense & Amplitude  |       |       |
|--------------|-------------------------|-------|------|-------|----------------------|--------------------|-------|-------|
|              | Day                     | Began | Max. | Ended |                      | H(nT)              | D(nT) | Z(nT) |
| PORT MORESBY |                         |       |      |       |                      | Nil sfe's reported |       |       |
| GNANGARA     |                         |       |      |       |                      | Nil sfe's reported |       |       |
| CANBERRA     |                         |       |      |       |                      | Nil sfe's reported |       |       |

29.

100