DEPARTMENT OF
MINERALS AND ENERGY

BUREAU OF MINERAL RESOURCES, GEOLOGY AND GEOPHYSICS

Record 1974/193

PORT MORESBY GEOPHYSICAL OBSERVATORY
ANNUAL REPORT,
1973

by

I.D. Ripper and B.A. Gaull

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SUMMARY

Standard observatory programs in seismology and geomagnetism were continued at Port Moresby during 1973 by the Bureau of Mineral Resources. Ionospheric recording ceased in March. Operation of the Papua New Guinea seismograph and accelerograph network continued.

The regional seismicity continued to decrease from the high level reached in 1971.

1. INTRODUCTION

The Bureau of Mineral Resources, Geology and Geophysics (BMR) opened a geophysical observatory at Port Moresby in 1957 (Observatory Staff, 1965). Appendix 1 is a summary of the principal events in the history of the observatory. Detailed annual accounts of operations to 1972 have been issued as BMR Records. (e.g., Ripper & Gaull, 1974).

This report describes the activities during the year 1973. In addition to seismological, geomagnetic, and ionospheric recordings at Port Moresby, networks of seismograph and accelerograph stations were maintained in conjunction with other government and private agencies. Observatory personnel also took part in the East Papua Crustal Survey: they provided logistic support in Port Moresby; helped to set up an outpost 'base' at Popondetta; provided a visual station at the office; and provided personnel to help with the fieldwork.

A brief review of the 1973 regional seismicity and a list of all well recorded earthquakes in the New Guinea/Solomon Islands region are given herein.

The security of the office was improved by the installation of a fire alarm system and security lights.

2. STAFF AND VISITORS

Tables 1 and 2 give details of staff during 1973. The number of man-days spent by staff in visits to other Papua New Guinea centres were: Popondetta (for the East Papua Crustal Survey), 10; Talasea, 9; Momote, 8; Lae, 6; Yonki, 5; Kavieng, 5; Rabaul, 4; Wabag, 4; Wewak, 3; Musa Damsite, 3; Frieda River, 2.

The Observer-in-Charge, I.B. Everingham, visited the Bureau of Mineral Resources headquarters in Canberra for the annual planning meeting in August. He presented a paper, 'Large earthquakes in the New Guinea Solomon Islands area', to the Symposium on Recent Crustal Movements at Bandung, Indonesia in October (Everingham, 1974). While in Bandung, Everingham also attended a meeting of Working Group 1 of the International Commission on Geodynamics.

Everingham chaired meetings of the Papua New Guinea Advisory Committee on Seismology and Earthquake Engineering throughout the year. In May, he attended the 2nd meeting of the Australian National Committee on Earthquake Engineering in Sydney, and briefly visited Canberra Head Office.

Ripper attended the 14th ANZAAS Congress in Perth (August), where he presented a paper, 'Anomalous aspects of New Guinea seismicity' (Ripper, in prep.)

Table 3 lists visitors to the observatory during the year.

3. SEISMOLOGY

Tables 4 and 5 list the co-ordinates and instrumentation of the seismograph stations operated by the observatory in 1973. Plate 1 shows the positions of seismograph stations operated by the observatory and by the Geological Survey of Papua New Guinea (GSPNG). The observatory took over the felt-intensity reporting system, with the exception of reports from volcano sites, previously operated by the Rabaul Observatory.

Recording stations

Port Moresby (PMG). Routine recording continued on the Port Moresby Worldwide Standard Seismograph (WWSSN), and regular calibration checks were made. The supplementary Willmore, Sprengnether, and Wood-Anderson seismographs continued to operate as standby instruments to the WWSSN for recording strong ground motion and for magnitude determinations. A tape recording seismograph was operated for the Department of Terrestrial Magnetism, Carnegie Institution of Washington.

No recordings were made on 23 and 24 December owing to a mains power failure.

Konedobu (KDB). The station operated whenever a pen recorder was available in the office laboratory. Recordings were used for visual monitoring of earthquake activity. Results were not reported in the seismic bulletins.

A Willmore seismometer and chart recorder were operated at KDB to record the East Papua Crustal Survey marine explosions.

Kavieng (KAV & KVG). Operation was intermittent and poor. EMI power unit, amplifier, and pen galvanometer breakdowns all contributed to the low number of recorded earthquakes during the year (Table 8). On 1 August, the station was moved from the Tigrak Agricultural Station to the town office of the Department of Agriculture, Stocks and Fisheries because the agricultural station was no longer staffed. The change in station

co-ordinates (Table 4) necessitated a change in station code (KAV to KVG).

Laetech (LAT). The station was operated by personnel of the University of Technology, Lae. Operation was satisfactory. A medium-period vertical system (1-second-period seismometer, 14-second-period galvanometer) was installed on 11 July as a low-gain seismograph.

Momote (MOM). The Momote station on Manus Island was operated by personnel of the Papua New Guinea National Meteorological Service. Operation was satisfactory except during July, August, and September, when battery and EMI power unit problems caused intermittent operation.

Talasea (TLS). The station operated normally during the year.

Wabag (WAB). The station closed down in January while the operator took annual leave. Wood-Anderson operation during June to September was intermittent as the suspension tended to jam. Willmore vertical operation was satisfactory.

Panguna (PAA). The Panguna station is owned and operated by Bougainville Copper Limited but the seismograms are interpreted by observatory staff. Operation during 1973 was normal except for amplifier breakdowns in August and September.

Accelerograph network

Table 6 lists data on accelerograph operated in Papua New Guinea in 1973. The instrument sites are shown in Plate 1.

Accelerograph movements during 1973 were:

Date	Instrument	From	To	Action
05 Jan	1 BMR M02	-	Port Moresby	Installation
07 Feb	1 Kennecott MO2	Star Mountains	Port Moresby	Repair
22 Feb	1 Kennecott M02	Port Moresby	Star Mountains	Reinstallation
22 Feb	1 BMR M02	Port Moresby	Lae DCA Transmitter stn	Installation
04 Apr	1 PWD M02	Lae - Botany	Port Moresby	Repair
04 Apr	1 PWD M02	Port Moresby	Lae - Botany	Reinstallation
07 Aug	1 PWD M02	Ramu - Yonki	Port Moresby	Repair
07 Aug	1 PWD M02	Port Moresby	Ramu - Yonki	Reinstallation
08 Aug	1 PWD M02	Wewak	Port Moresby	Repair
09 Aug	1 Carpentaria Exploration Co M02	Frieda River	Port Moresby	Repair
20 Sep	1 PWD M02	Port Moresby	Wewak	Reinstallation
Nov	1 Kennecott M02	Star Mountains	Port Moresby	Repair

In February the run control circuit in the Star Mountains No. 2 (Hong Kong) accelerograph was replaced, as the accelerograph would not trigger. A general maintenance check was necessary in November after the shelter failed, resulting in saturation of the accelerograph.

The accelerograph at Botany, Lae, was replaced so that the time marks could be restored. An electric motor cog wheel was repaired on the accelerograph removed from Yonki. The lamp voltage in the accelerograph removed from Wewak was low.

The Frieda River B accelerograph was inoperative in August owing to failure of the trigger mechanism, the time marks, and the run control system. Condensation which entered the accelerograph may have caused the failures. The time marks also failed in the Lae (DCA) and Port Moresby accelerographs.

The earthquakes which triggered accelerographs in 1973 are listed in Table 7.

Collection and distribution of data

Records were mailed about twice weekly from the seismograph stations and analyses of all seismograms were then carried out at the observatory office, Port Moresby. P-wave arrival times were telegraphed to the United States Environmental Research Laboratories (ERL). Weekly bulletins listed all seismic analyses. Phase data were transcribed onto card punch forms for processing and for inclusion, at BMR (Canberra), in a magnetic tape for the International Seismological Centre (ISC), Edinburgh. Table 8 lists the monthly number of seismic events recorded by each station.

Felt effects and ERL hypocentres were entered on the storage and retrieval computer file held at the Computer Centre, Port Moresby. Accelerograms were forwarded to BMR, Canberra, for digitization and analysis.

The earthquakes for which intensity questionnaires were distributed are listed in Table 9.

New Guinea/Solomon Islands region seismicity, 1973

The level of seismicity in 1973 was lower than in 1972. The number of earthquakes recorded by PMG dropped from 4056 in 1972 to 2979 in 1973 (Table 8). Eleven M6 and no M7 earthquakes occurred in the New Guinea/Solomon Islands region. Intensities of MM6 were experienced in the New Guinea highlands, on the north coast of New Guinea, in the southeast of Papua, on New Britain, and on Bougainville. MM7 intensities occurred at Ambunti on the Sepik River and Tabiguba in the Highlands from the M6.5 earthquake which occurred at a depth of 112 km beneath northern New Guinea on 13 August.

Earthquakes in the New Guinea/Solomon Islands region for which ERL used 15 or more stations to compute the hypocentres are listed in Table 10. Plate 2 shows the epicentres of earthquakes with magnitudes M6 and greater.

Reports

In addition to the two papers prepared for presentation at meetings (Everingham, 1974; Ripper, in prep.), two other reports were drafted (Gaull, 1974; Everingham, in prep.).

4. GEOMAGNETISM

Normal-run magnetograph

Variations in geomagnetic horizontal intensity (H), vertical intensity (Z), and delination (D), at Port Moresby were recorded by a La Cour 15 mm/hour magnetograph. 213 hours of recording were lost owing to: the clutch being incorrectly engaged by the operator (160 hours); mains power failures from 23-25 December (51 hours); and repairs being carried out in the vault (2 hours).

Magnetometers

A set of 'absolute' observations using 3 QHMs (Nos 187, 188, and 189), BMZ (No. 68), and Askania declinometer (No. 580339) was made once a week. The preliminary instrument corrections used in the calculation of all preliminary results are shown in Table 11.

Scale values

H and Z scale values were measured weekly, and D scale values were measured monthly, using coil currents of 6mA and 10mA. The currents were provided by a BMR calibrator MCO-1 which was accurate to 0.05%. Adopted scale values and standard deviations are shown in Table 12.

Baseline values

The H baseline values continued to drift downward, and required 1 nT decrements in adopted values about every 6 days. The D baseline values showed only small fluctuations about the mean. On 27 March, the Z trace was recentred, resulting in a change in adopted baseline value of 96 nT.

Orientation

A test made on the Z variometer on 18 June showed that the Z magnet was N pole south and up at an angle of $0.2 \pm 0.3^\circ$. The orientations of the D and H magnets were not measured in 1973, but they were N $0.4^\circ \pm 0.2^\circ$W and E $0.2^\circ \pm 0.2^\circ$N as estimated from 1972 and 1974 results.

Data reduction and distribution

Preliminary scale and baseline values were sent with the 35-mm

magnetogram copies to World Data Centre A, and with the magnetograms to BMR Observatory Group, Canberra, for the mean hourly value derivation program. Recorded solar flare effects, sudden commencements, sudden impulses, storms, and pulsations were reported monthly to the Data Centre and to other international agencies.

Monthly mean values for 1973 of D, H, Z, and F and the K-index at Port Moresby are listed in Table 13; H continued to decrease steaily at a rate of about 25 nT/year, while Z increased at a slightly greater rate (about 40 nT/yr) than the average (about 30 nT/yr) for the past 10 years. D continued its easterly trend of 1'/yr. Table 14 gives the annual mean values of all components for the 11-years, 1963-1973.

5. IONOSPHERICS

The ionosonde operated intermittently during January, February and March. It was closed down on 27 March because the age of the ionosonde caused continuing maintenance problems, and it was dismantled and returned to the Ionospheric Prediction Service, Sydney.

6. ACKNOWLEDGEMENTS

For their assistance with the operation and maintenance of the seismograph and accelerograph networks, the following are gladly acknowledged: the Australian Departments of Housing and Construction, and of Civil Aviation; the Papua New Guinea Departments of Lands Surveys and Mines, and of Agriculture Stocks and Fisheries; the National Meteorological Service; the Bureau of Water Resources; the Division of District Administration; Kennecott Pacific Pty Ltd; Carpentaria Exploration Co.; and Bougainville Copper Ltd.

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APPENDIX

PRINCIPAL EVENTS,

PORT MORESBY GEOPHYSICAL OBSERVATORY, 1957-1973

1957 Mar	Port Moresby regular absolute observations (D, H, Z) commenced
1957 Dec	PMG seismograph recording commenced
1958 Mar	Port Moresby normal-run geomagnetic recording commenced
1959 Oct - 1971 Oct	Port Moresby rapid-run geomagnetic recording
1961 May - 1973 Mar	Port Moresby ionospheric recording
1962 - 1963	Regional magnetic survey, Papua New Guinea
1962 Jul	WWSSN station installed at PMG
1964 Jan	Gravity calibration range established in Port Moresby
1964 Nov - 1966 Dec	TPN LP-Z seismograph operation
1964 Dec - 1965 Dec	POP LP-Z seismograph operation
1965 Dec - 1967 Mar	KRG LP-Z seismograph operation
1966 Feb - 1966 Oct	DNG LP-Z seismograph operation
1966 Jul	DTM wide-band high dynamic range seismograph installed at PMG
1966 Nov - 1967 May	LAE LP-Z seismograph operation
1967 Jan - 1967 May	TPN SP-Z seismograph operation
1967 May	LAE seismograph converted to SP-Z
1967 Jul - 1970 May	GRK SP-Z seismograph operation
1967 Aug	2 M02 accelerographs (property of CRA) installed at Kieta and subsequently moved to Panguna
1967 Oct	Ramu (Yonki) M02 (CDW) accelerograph installed

1968 Apr - 1972 Nov	Rabaul (Sulphur Creek) M02 (CDW) accelerograph operation
1968 Sep	WEW aftershock recording
1968 Oct - 1968 Dec	WEK aftershock recording
1968 Oct	Wewak M02 (CDW) accelerograph installed
1968 Dec	WAB SP seismograph operation commenced
1969 Apr - 1969 Jun	Regional magnetic survey, Papua New Guinea
1969 Jul	Ramu (Intake) M02 (CDW) accelerograph installed
1969 Oct	MOM SP seismograph operation commenced
1970 Mar - 1972 Nov	GKA SP seismograph operation (in lieu of GRK)
1970 May	LAT SP seismograph operation (in lieu of LAE)
1970 Nov	MAD aftershock recordings
1971 May	Frieda River A M02 accelerograph (property of Carpentaria Exploration) installed
1971 Jul	Lae (CDW yard) M02 accelerograph installed
1971 Aug - 1972 May	PNG SP seismograph operation and aftershock recordings
1971 Aug	KAV SP seismograph operation commenced
1971 Aug	Rabaul (Observatory) M02 accelerograph installed
1971 Aug	Frieda River B M02 accelerograph (property of Carpentaria Exploration) installed
1971 Aug	Star Mountains (No. 1) M02 accelerograph (property of Kennecott) installed
1971 Sep	Star Mountains (No. 2) M02 accelerograph (property of Kennecott) installed
1971 Nov	Lae (Botany Building) M02 (CDW) accelerograph installed
1972 Jun - 1972 Dec	Musa Damsite - two M02 accelerographs operated

1972 Aug - 1972 Nov	Lae P & T repeater station - SMA/1 (CDW) accelerograph operated
1972 Sep - 1972 Nov	Lae DCA transmitter station - SMA/1 (CDW) accelerograph operated
1972 Nov	Rabaul (Wanliss Street) M02 (CDW) accelerograph installed (removed from Sulphur Creek)
1973 Feb	Lae DCA transmitter station - M02 (BMR) accelerograph installed
1973 Aug	KVG recording commenced (in lieu of KAV)

TABLE 1

OBSERVATORY STAFF, 1973

Officer	Designation
Australian Public Service	
I.B. Everingham	Geophysicist Class 3 (Observer-in-Charge)
I.D. Ripper	Geophysicist Class 2
B.A. Gaull	Geophysicist Class 1
M. McMullan	Geophysicist Class 1 (until 7 February)
Mrs W.M.J. Byrne	Technical Officer Grade 2
J.T. Vote	Technical Officer Grade 2 (until 17 December)
B. Page	Technical Officer Grade 1 (8 May-13 August)
P. Mendrinos	Technical Officer Grade 1 (from 19 July)
Mrs A. Dawe	Stenographer
Papua New Guinea Public Service	
P. Rupa	Clerk Class 3
A. Tom	Technical Assistant Grade 1
B. Nesol	Technical Assistant Grade 1 (from 8 March)
F. Sevese	Clerical Assistant Grade 1
A. Kaila	Gardener
D. Kepalan	Observer, Wabag
H. Mohi	Observer, Talasea

ASSOCIATED PERSONNEL, 1973

Officer	Designation
J. Wui	Gardener
S. Geno	Student (until 9 February)
Miss C. Odendahl	Typist (from 10 December)

TABLE 3

VISITORS TO THE PORT MORESBY GEOPHYSICAL OBSERVATORY

1973

Visitor	Organization	Month
A. Hara	Sc. Univ. Tokyo	January
B. Hicks	Stenhouse New Guinea	January
T. Stone	Ionospheric Prediction Service, Sydney	January
Prof. D. Mansell	University of Melbourne	February
C. Bubb	Department of Housing & Construction, Melbourne	February
R. Hill	CSIRO	February
H. Lachlan	Department of Minerals & Energy	March
K. McCue	Imperial College, London	March
J. Field	University of Queensland	March
J. Prince	Preece, Cardew & Rider	March
J. Cavanaugh	Jant Pty Ltd	May
Prof. Y.D. Boulanger	Soviet Geophysical Committee	May
J. Dooley	BMR	May
R. Page	Department of Minerals & Energy	May
Prof. A. Furumoto	University of Hawaii	June
D. Beresford	CSIRO	July
Prof. D. Cox	University of Technology, Lae	August
Prof. Basset	University of San Diego	October
East Papua Crustal Survey members		Oct, Nov, Dec

TABLE 4

PORT MORESBY GEOPHYSICAL OBSERVATORY SEISMOGRAPH NETWORK, 1973

STATION DETAILS

Station	Code	Lat. (°S)	Long. (°E)	Elevation (m)	Foundation	Remarks
Port Moresby	PMG	09° 24' 33"	147° 09' 14"	67	Eocene cherts	
Konedobu	KDB	09° 28' 18"	147° 09' 36"	35	Eocene cherts	
Kavieng	KAV	02° 34' 24"	150° 49' 00"	4	Brown soil	until July
Kavieng	KVG	02° 34' 20"	150° 47' 42"	1	Coral	from August
Lae Tech	LAT	06° 39' 10"	147° 00' 00"	72	Alluvium	
Momote	MOM	02° 04' 28"	147° 24' 41"	10	Coral	
Wabag	WAB	05° 29' 41"	143° 43' 42"	2032	Clay	
Talasea	TLS	05° 18' 35"	150° 02' 41"	(40)	Volcanic soil	
Panguna	PAA	06° 18' 02"	155° 29' 28"	699	Diorite stock	

TABLE 5

PORT MORESBY GEOPHYSICAL OBSERVATORY SEISMOGRAPH NETWORK, 1973

SEISMOGRAPH DATA

Station	Seismometer	Component	Ts(s)	Tg(s)	Magnification	Recorder	Remarks
PMG	WWSSN	Z, N, E	1.0	0.75	25 000 at 1 s	Photo drum	
		Z	15.0	100	1500 at 15 s	Photo drum	
		N, E	15.0	100	375 at 15 s	Photo drum	
	Willmore	Z	0.7	0.3	30 000	Photo drum	
	Wood-Anderson	N, E	0.8	-	2042	Photo drum	
	Sprengnether	N, E	15.0	14	-	Photo drum	
KDM	Willmore	Z	0.7	-	-	Pen drum	
KAV (KVG)	Willmore	Z	0.7	-	-	Pen drum	
LAT	Willmore	Z	0.7	0.7	-	Photo drum	
	Willmore	Z	1.0	14	-	Photo drum	from July
	Wood-Anderson	E	0.8	-	2042	Photo drum	
MOM	Willmore	Z	0.7	0.3	-	Photo drum	
	Wood-Anderson	E	0.8	-	2042	Photo drum	
WAB	Willmore	Z	0.7	1.3	-	Photo drum	
	Wood-Anderson	N	0.8	-	2042	Photo drum	
PAA	Willmore	Z	1.0	-	40 000	Helicorder	
TLS	Willmore	Z	0.7	0.7	-	Photo drum	
	Wood-Anderson	E	0.8	-	2042	Photo drum	

TABLE 6

PAPUA NEW GUINEA ACCELEROGRAPHS, 1973

1. SITE DATA

Place	Operator	Co-ordinates	Elevation	Foundation
Bougainville Panguna (1)	Bougainville Copper Pty Ltd	6.325°S 155.485°E	640 m	Unconsolidated volcanic ash
Bougainville Panguna (2)	Bougainville Copper Pty Ltd	Panguna	-	Consolidated rock, agglomerate
Frieda River A	Carpentaria Exploration/BMR	4.7°S 141.8°E	-	Alluvium
Frieda River B	Carpentaria Exploration/BMR	4.7°S 141.8°E		Hard rock
Lae, Botany	BMR	6.713°S 146.999°E	50 m	Alluvium
Lae, PWD	BMR	6.723°S 146.989°E	25 m	Coarse clastic alluvials
Lae, DCA	BMR	6.731°S 146.986°E	-	Alluvium - near swamp
Lae, P & T	BMR	6.728°S 147.009°E	-	Consolidated rock overlain by clay
Lae, Bumbu Bridge	University of Technology	6.698°S 147.000°E	-	On concrete pier, 20 m gravel
Lae, University of Technology	University of Technology	6.674°S 146.995°E	58 m	30 m gravel
Musa River A	BMR	9.556°S 148.674°E	406 m	Alluvium
Musa River B	BMR	9.556°S 148.679°E	112 m	Weathered gabbro
Konedobu	BMR	9.472°S 147.160°E	35 m	Eocene chert
Rabaul Observatory	BMR	4.191°S 152.170°E	184 m	Basalt flow
Rabaul, Wanliss Street	BMR	4.194°S 152.186°E	25 m	Basalt flow
Ramu, Intake	Australian Department of Housing & Construction (DHC)	6.232°S 145.975°E	1190 m	Miocene siltstone and greywacke
Ramu, Yonki	DHC/BMR	6.245°S 145.978°E	1250 m	Recent lake sediments
Star Mountains 1 (Base Camp)	Kennecott/BMR	5.209°S 141.197°E	678 m	Landslide material underlain by siltstone
Star Mountains 2 (Hong Kong)	Kennecott/BMR	5.207°S 141.137°E	2076 m	Quartz porphyry
Wewak	DHC/BMR	3.590°S 143.687°E	10 m	Weathered coral

TABLE 6 (continued)

PAPUA NEW GUINEA ACCELEROGRAPHS, 1973

2. INSTRUMENT DATA

Type and Block No.	Calibration Data (g/cm)	Site	Date	Owner	Remarks
M02 39	0.564 0.576 0.372	Bougainville Panguna (1)	1973	CRA	
M02 43	0.549 0.574 0.382	Bougainville Panguna (2)	1973	CRA	
M02 416	0.610 0.602 0.372	Frieda River A	1973	Carpentaria Exploration	
M02 453	0.614 0.593 0.400	Frieda River B	1973	Carpentaria Exploration	
M02 475	0.559 0.556 0.397	Lae Botany	to 4/4/73	PNG Department of Public Works (PWD)	No time marks
M02 259	0.581 0.596 0.403	Lae Botany	From 4/4/73	BMR	
M02 1118A	0.560 0.524 0.371	Lae PWD	1973	BMR	
SMA-1 S/N 578	1.82 1.85 1.77	Musa River A	1973	PWD	
SMA-1 S/N 577	1.90 1.95 1.70	Musa River B	1973	PWD	
M02 476	0.509 0.517 0.374	Lae Posts & Telegraphs	1973	BMR	Makeshift timing No Z component
M02 249	0.639 0.636 0.418	Lae Bumbu Bridge	1973	University of Technology	
M02 79	0.612 0.628 0.412	Lae University of Technology	1973	University of Technology	
M02 446	0.589 0.638 0.393	Port Moresby Observatory Office Konedobu	From 5/1/73	BMR	No time marks

TABLE 6 (continued)

Type and Block No.	Calibration Data (g/cm)	Site	Date	Owner	Remarks
M02 117	0.627 0.634 0.408	Lae Department of Civil Aviation	From 22/2/73	BMR	Time marks U/S from August
M02 1467A	0.611 0.636 0.385	Rabaul Observatory	1973	BMR	
M02 163	N/A	Rabaul Wanliss Street	1973	PWD	NS and Z trace position reversed
M02 425	0.614 0.591 0.425	Ramu Yonki	1973	PWD	
M02 44	0.555 0.556 0.384	Ramu Intake	1973	PWD	
M02 1428	0.581 0.604 0.402	Star Mountains 1 (Base Camp)	1973	Kennecott	
M02 1454	0.619 0.615 0.404	Star Mountains 2 (Hong Kong)	1973	Kennecott	
M02 162	0.635 0.652 0.430	Wewak	1973	PWD	

TABLE 7

PAPUA NEW GUINEA ACCELEROGRAPH TRIGGERINGS, 1973

MN	DY	HR	MIN	SEC	DPH	LAT°S	LONG°E	M	ML	ACCELEROGRAPH	INTENSITY (MM) AT SITE	PRELIM MAX. ACCEL. (g)	PREDOMINANT PERIOD AT MAX. ACCEL. (secs)
02	11	10	32	40.2	078	06.6	147.4	5.5	5.9	Lae, Botany	4 - 5	0.05	0.20
										Lae, PWD	"	0.10	0.17
										Lae, P & T	"	0.03	0.14
03	22	17	18	02.2	101	06.1	147.0	5.1	5.0	Lae, DCA	4 - 5	0.04	0.12
										Lae, Bumbu Bridge	"	-	-
08	13	08	28	19.7	112	04.5	144.0	6.5	6.4	Yonki	5 - 6	0.025	0.22
										Lae, DCA	4	0.007	0.15
										Lae, P & T	4	0.006	0.15
08	23	16	55	25.9	078	05.4	151.5	6.1	6.2	Rabaul	5	0.014	0.22
08	24	20	18	21.4	062	07.2	156.0	6.1	5.9	Panguna	6	0.12	0.15
10	03	13	19	47.0	108	06.5	146.7	5.1	4.9	Yonki	4	0.07	0.18
10	14	22	06	50.4	060	06.4	154.9	5.9	6.2	Panguna	5	-	-
11	19	15	25	37.6	123	05.8	146.2	4.9	5.0	Yonki	4	0.05	0.20
11	25	16	58	48.5	116	05.9	148.6	4.9	5.1	Yonki	4	0.007	-

TABLE 8

NUMBER OF SEISMIC EVENTS RECORDED BY EACH STATION
1973

	PMG	KAV	KVG	LAT	MOM	PAA	TLS	WAB
January	399	9		172	76	107	100	
February	258	23		171	53	77	146	133
March	298	4		206	71	100	116	182
April	244	9		165	34	95	101	168
May	210	1		167	69	100	131	204
June	240			225	67	119	132	131
July	249	12		172	2	87	144	194
August	169		26	147	19	10	80	204
September	123		15	190	26	19	105	154
October	196			134	56	86	128	162
November	312			164	65	114	158	190
December	281			209	108	178	219	144
TOTAL	2979	58	41	2122	646	1092	1560	1866

TABLE 9

EARTHQUAKES FOR WHICH INTENSITY QUESTIONNAIRES WERE DISTRIBUTED, 1973

MN	DY	HR	MIN	SEC	DPH (km)	LAT °S	LONG °E	M	ML	MAX. MM INTENSITY
01	18	09	28	14.1	043	06.9	150.0	6.9	6.6	5 - 6
02	11	10	32	40.2	078	06.6	147.4	5.5	5.9	5
03	22	17	18	02.0	101	06.1	147.0	5.1	5.0	5
05	01	10	40	46.9	027	10.0	150.2	6.2	6.5	5 - 6
05	02	01	26	20.9	029	10.0	150.2	6.0	6.4	5 - 6
08	13	08	28	19.7	112	04.5	144.0	6.5	6.4	7
08	23	16	55	25.9	078	05.4	151.5	6.1	6.2	6
08	24	20	18	21.4	062	07.2	156.0	6.1	5.9	6

TABLE 10

EARTHQUAKES IN THE NEW GUINEA/SOLOMON ISLANDS REGION, 1973

(ERL HYPOCENTRES, 15 OR MORE STATIONS USED IN LOCATIONS)

MN	DY	HR	MI	SEC	DPH (km)	LAT °S	LONG °E	MB ERL	ML	MS	M	NO. STNS	PDE
01	01	03	46	09.8	041	09.2	150.6	5.3	5.3		5.3	25	1
	10	11	32	27.4	032	11.1	162.3	5.6		5.9	5.9	80	3
	10	11	46	43.7	032	11.2	162.3	5.0		5.9	5.9	42	3
	12	08	45	32.8	111	05.6	154.4	4.5	4.5		4.5	26	2
	16	09	47	01.9	007	03.5	135.5	5.5			5.5	20	2
	17	02	23	49.5	033	02.4	138.8	5.2	6.4	4.8	5.2	30	3
	18	09	28	14.1	043	06.9	150.0	6.3	6.6	6.9	6.9	77	3
	20	18	15	06.7	040	06.9	150.1	4.7	4.8		4.3	17	9
	20	18	24	16.1	075	06.9	155.8		6.1		5.5	22	9
	21	12	19	43.7	046	05.5	153.3	4.6	5.3		4.6	20	4
	22	23	45	36.7	072	06.0	149.7	5.2	6.1		5.6	57	4
	23	15	26	18.6	009	09.2	156.0	5.2			5.2	29	6
	25	09	50	30.9	033	07.0	150.0	4.8	5.3		4.8	31	6
02	04	22	37	58.1	061	05.8	151.1	5.2	5.2		4.8	27	8
	11	10	32	40.2	078	06.6	147.4	5.1	5.9		5.5	53	10
	14	09	21	21.7	033	06.7	131.3	5.4			5.4	31	11
	14	09	32	58.8	062	09.9	160.9	5.9		5.5	6.0	90	14
	16	23	38	32.8	078	06.1	148.6	5.5	5.7		5.5	46	11
	20	19	23	36.7	042	02.5	152.9	5.0	5.3		4.8	25	13
	21	12	14	47.2	090	05.3	151.5	5.3	6.3		5.9	54	10
	22	16	22	32.2	154	04.6	151.8	5.3	5.3		6.0	81	11
	23	11	08	23.9	021	07.0	150.0	5.2	5.2		5.0	42	10
	25	03	41	35.6	194	05.5	147.1	4.8	5.1		4.6	22	13
03	06	15	51	49.2	028	05.7	152.8	5.1	5.1		4.8	26	15
	09	14	56	00.7	023	02.4	139.0				4.5	17	17
	09	15	27	08.6	050	03.1	139.1	5.3			5.2	27	15
	13	01	42	43.6	170	05.4	154.2	5.5	6.0		5.7	76	20
	13	20	01	08.4	035	06.4	153.1	5.3			5.4	34	21
	14	11	25	46.7	064	05.3	152.2	5.8	6.4		6.2	80	20
	17	19	17	20.3	059	04.8	145.1		5.2		4.8	16	24
	22	17	18	02.0	101	06.1	147.0	5.1	5.0		5.1	34	21
	22	18	39	53.4	070	06.1	148.7	5.1	5.4		5.0	32	21
	22	21	13	09.6	018	05.5	151.3	4.9			4.5	16	18
	24	05	49	27.2	055	11.2	161.6	5.1			5.0	30	20
	25	09	53	13.3	068	05.2	153.6	5.2			5.0	26	20
	28	16	45	25.3	081	04.5	141.8	5.5	5.0		5.5	36	18

TABLE 10 (continued)

MN	DY	HR	MI	SEC	DPH (km)	LAT °S	LONG °E	MB ERL	ML	MS	M	NO. STNS	PDE
04	01	06	12	13.9	033	11.3	162.5	4.6			4.2	15	20
	04	09	54	50.9	033	04.8	131.9	5.1			5.0	21	20
	07	16	39	47.7	097	05.7	154.4	4.9	6.0		5.0	23	22
	08	22	51	56.4	066	05.5	146.5	4.9	6.2		5.1	29	23
	11	02	06	46.4	048	02.6	138.7	5.2			5.2	44	27
	11	17	48	02.9	033	04.5	135.1	4.9			4.6	17	31
	13	01	41	15.7	047	04.2	135.1	4.8			4.6	20	28
	15	03	35	51.9	110	06.0	146.1	5.3	5.9		5.8	84	34
	17	12	34	26.5	033	04.4	134.0	5.7		6.4	6.3	68	26
	21	21	09	51.2	029	06.4	144.3	5.2	5.0		5.0	32	25
	23	14	42	23.1	082	10.2	161.1	5.0			4.9	31	26
	25	15	53	41.0	005	03.8	151.3	4.5			4.7	28	28
	26	03	14	38.5	036	10.0	152.3	4.7			4.5	17	28
	26	03	56	23.5	032	10.2	152.3	4.7			4.5	18	29
	26	20	06	53.0	023	06.3	144.3	5.2	5.2		5.1	28	25
05	01	10	40	46.9	02	10.0	150.2	5.9	6.5	5.4	6.2	80	28
	02	01	26	20.9	029	10.0	150.2	5.6	6.4	5.2	6.0	69	28
	03	23	04	31.5	039	10.4	161.8	4.8			4.6	17	31
	05	01	35	19.5	015	08.2	156.4	5.4			5.5	39	28
	06	15	58	50.6	060	03.7	137.8	5.4			5.5	36	30
	06	19	02	38.0	044	05.5	153.2	4.5			4.2	15	31
	08	12	28	31.0	105	04.4	153.5	4.4			4.2	22	29
	12	16	20	09.2	013	03.7	152.1	5.5		5.9	5.8	77	37
	12	19	36	45.8	043	04.3	134.3	5.2			5.2	25	42
	13	18	30	48.9	016	03.8	151.9	4.7			4.4	15	37
	18	13	20	10.2	034	06.2	151.8	5.8	5.7	5.1	5.9	74	32
	22	22	04	58.4	013	10.0	150.3	5.5	6.1	5.0	5.7	48	33
	25	16	28	57.7	057	05.5	146.4	5.2	5.6		5.2	28	31
	27	00	29	46.0	025	06.3	147.0	5.2	5.6		5.2	33	31
06	01	23	36	00.4	044	06.5	150.4	4.8	5.1		4.6	15	34
	04	13	02	38.0	077	05.8	151.3	4.7	5.3		4.6	15	37
	06	06	52	56.6	048	06.5	147.3	5.0	4.8		4.7	24	36
	07	16	58	19.9	046	09.5	159.2	4.8			4.6	20	36
	09	01	05	13.9	017	03.4	147.0	5.0			4.9	30	37
	09	01	59	36.3	148	05.4	154.2	5.2			5.1	23	36
	09	08	21	27.3	070	10.3	161.4	6.3		6.7	6.8	97	36
	10	21	37	55.2	144	05.5	150.1	4.5	5.1		4.6	21	37
	12	12	21	30.2	047	06.6	154.9	4.9			4.9	17	39
	16	15	04	51.4	122	05.9	130.6	5.1			5.0	25	43
	19	02	10	26.3	048	06.5	154.8	5.2			5.2	17	42

TABLE 10 (continued)

MN	DY	HR	MI	SEC	DPH (km)	LAT °S	LONG °E	MB ERL	ML	MS	M	NO. STNS	FDE
06	23	00	25	15.9	033	02.4	139.3	5.3		4.6	5.3	41	42
	23	00	39	07.2	042	11.1	162.2	4.7		5.2	5.0	26	29
	24	17	58	49.6	065	00.9	130.6	5.2			5.2	19	41
	25	15	59	20.2	236	05.6	148.3	4.2	5.2		4.5	20	45
	28	17	14	17.1	063	03.2	134.4	5.2			5.2	25	40
	28	20	23	01.7	033	05.5	131.5	5.4			5.4	30	40
	30	13	23	10.3	033	03.8	131.1	5.2			5.1	15	43
07	03	17	58	25.5	027	06.1	152.7	4.8	5.1		4.9	21	41
	05	19	24	19.7	150	04.9	151.7	5.2	5.8		5.2	21	41
	07	15	40	40.0	053	06.0	150.6	5.4	5.5		5.5	40	43
	09	02	18	59.7	033	03.4	149.1	4.6	4.4	4.8	4.3	15	43
	12	12	01	20.9	009	06.1	153.8	5.7			5.4	17	46
	13	14	06	07.9	055	06.3	154.8	5.3			5.6	34	44
	16	03	59	30.3	040	10.2	151.9	5.3	5.7	5.1	5.3	47	45
	17	00	14	47.7	033	04.3	134.5	5.3			5.2	27	44
	21	09	23	49.1	044	06.2	150.7	4.7	5.0		4.4	24	44
	23	08	34	40.0	221	05.4	146.9	5.1	5.3		5.1	43	44
	24	04	19	11.7	040	09.3	156.1	5.1			5.0	20	45
	25	06	08	38.7	069	08.7	160.7	5.5			5.7	53	44
	25	06	40	09.3	077	08.7	160.8	5.0			5.0	37	44
	26	10	55	24.8	075	05.1	153.3	4.6			4.3	15	50
	27	07	34	53.6	038	07.3	154.5	5.0			5.1	44	47
	27	21	59	30.6	060	06.3	154.4	5.4			5.0	16	44
	27	23	36	46.7	05	06.6	155.0	5.1			5.0	17	44
	31	20	44	52.2	030	08.6	161.0	5.4		6.1	5.9	60	50
	31	21	52	30.6	074	08.8	160.8	5.0			5.0	25	46
08	05	07	44	15.4	062	06.2	147.9	4.9			5.2	32	46
	08	15	47	10.5	013	02.3	137.8	4.9			5.0	17	51
	09	09	38	59.2	404	06.1	154.5	5.4	6.5		5.8	46	46
	11	13	04	35.7	009	03.5	135.6	5.4			5.8	50	55
	13	08	28	19.7	112	04.5	144.0	6.0	6.4		6.5	122	51
	22	09	26	26.0	170	05.0	151.3	5.1	5.6		5.2	22	51
	23	16	55	25.9	078	05.4	151.5	5.7	6.2		6.1	75	51
	24	20	18	21.4	062	07.2	156.0	5.8	5.9		6.1	142	53
	29	23	54	47.4	025	08.3	156.5	4.9			4.6	18	53
09	07	09	31	14.8	061	05.6	151.5	5.5	6.1		5.7	43	53
	07	10	42	15.8	032	02.1	134.0	4.9			4.6	15	56
	07	13	58	33.6	071	05.5	151.1	5.6	5.9		5.8	64	55
	10	18	11	01.8	068	10.2	161.1	5.0			5.0	20	54

TABLE 10 (continued)

MN	DY	HR	MI	SEC	DPH (km)	LAT °S	LONG °E	MB ERL	ML	MS	M	NO. STNS	PDE
09	12	04	35	28.7	023	02.5	138.4	5.1			5.1	29	59
	12	18	44	31.6	114	08.6	148.1		4.6		4.2	16	59
	15	23	09	06.4	063	06.8	155.3	4.9			4.8	28	59
	25	22	20	50.2	033	01.0	136.5	5.2			5.0	21	60
10	01	23	44	12.0	266	04.5	151.5	5.4	5.1		5.3	45	57
	03	13	19	47.0	108	06.5	146.7	5.2	4.9		5.1	27	57
	07	20	35	35.9	245	05.4	146.8	4.6	4.8		4.3	15	61
	14	22	06	50.4	060	06.4	154.9	5.4	6.2		5.9	64	64
	29	05	27	25.5	036	03.0	139.3	5.7		5.5	5.8	60	63
11	02	03	00	53.7	056	05.7	147.5	4.7	4.8		4.6	20	65
	05	13	34	11.2	015	05.9	152.4	5.5	5.1		5.3	37	66
	07	07	18	39.8	033	05.9	153.6	5.1		5.0	5.0	29	68
	08	05	58	27.2	033	02.9	136.3	5.4			5.3	22	71
	08	21	07	50.9	018	06.2	151.8	5.4	5.0		5.3	28	66
	10	01	20	54.2	069	06.4	130.6	5.3			5.3	24	66
	10	11	30	17.7	014	04.4	131.1	5.2			5.2	15	67
	12	03	53	44.0	050	06.2	154.5	5.6		5.9	5.9	85	68
	12	07	16	29.0	119	06.6	146.6	4.5	4.6		4.1	15	67
	14	01	27	23.9	422	04.4	154.1	4.6			4.3	19	73
	19	15	25	37.6	123	05.8	146.2	5.2	5.0		4.9	16	71
	23	11	08	40.9	086	05.5	151.1	5.2	5.8		5.3	28	68
	25	16	58	48.5	116	05.9	145.6	5.0	5.1		4.9	15	70
	26	05	23	56.4	015	08.6	154.0	5.4	5.8	4.8	5.5	44	69
	28	17	01	59.3	033	11.7	162.5	5.3			5.2	18	72
	29	00	29	56.4	033	03.5	145.9	5.1		5.7	5.4	31	72
	30	18	41	08.0	028	06.3	154.1	5.5			5.5	19	76
12	01	21	18	23.9	020	01.9	134.2	5.1		5.2	5.2	31	70
	02	23	12	26.6	070	06.9	155.8	4.8			4.5	15	70
	03	02	01	32.2	035	02.8	139.1	5.3		5.0	5.3	34	69
	05	21	39	33.5	057	07.4	155.9	5.4			5.4	26	70
	06	16	57	40.3	073	04.7	152.7	4.4	5.1		4.6	24	72
	13	20	23	18.9	083	10.3	161.5	5.1			5.1	48	77

TABLE 10 (continued)

MN	DY	HR	MI	SEC	DPH (km)	LAT °S	LONG °E	MB ERL	ML	MS	M	NO. STNS	PDE
	16	09	47	18.5	010	06.9	150.9	4.8	5.4		4.8	23	74
	18	04	09	08.9	413	05.4	154.2	5.3	6.1		5.8	54	73
	20	02	41	37.4	033	02.5	139.9	5.0			4.9	21	75
	20	13	36	08.8	112	04.9	153.7	5.0	5.6		5.3	36	77
	21	12	02	58.5	043	02.0	141.2	5.3			5.3	27	74
	21	22	52	40.2	033	04.4	134.0	5.3			5.3	29	73
	23	05	35	34.3	046	05.7	153.6	4.3			4.0	16	73
	23	15	45	06.4	093	04.5	152.8	5.0	4.6		4.6	21	73
	25	10	45	30.4	139	05.7	148.6	4.6	5.3		4.5	15	73

MB ERL — ERL body wave magnitude as published by ERL

ML — Richter magnitude derived from Papua New Guinea stations

MS — Surface-wave magnitude obtained from teleseismic station bulletins and ERL

M — Weighted unified magnitude on the surface-wave scale

TABLE 11

PRELIMINARY MAGNETOMETER CORRECTIONS, 1973

1973	QHM 187 (nT)	QHM 188 (nT)	QHM 189 (nT)	Decl. 580339 (mins)	BMZ 68 (nT)
Jan	-117	-3	-78	0	0
Feb	-118	-4	-79	0	0
Mar	-118	-4	-79	0	0
Apr	-118	-4	-79	0	0
May	-119	-5	-80	0	0
Jun	-119	-5	-80	0	0
Jul	-119	-5	-80	0	0
Aug	-120	-6	-81	0	0
Sep	-120	-6	-81	0	0
Oct	-120	-6	-81	0	0
Nov	-121	-7	-82	0	0
Dec	-121	-7	-82	0	0

TABLE 12

NORMAL-RUN

MAGNETOGRAPH PARAMETERS, 1973

COMPONENT	DATE	SCALE VALUE	STD DEVIATION SCALE VALUE	STD DEVIATION BASELINE VALUE
D	1973	0.445	0.003	0.15
H	1973	2.75	0.02	1.5
Z	Jan 01	2.90	0.04	1.8
	Mar 01	3.00		
	Oct 01	3.05		
	Dec 01	3.10		

H scale value is So; 'a' factor = 0.003

D values in minutes and minutes per mm

H and Z values in nT and nT per mm

TABLE 13

PRELIMINARY MONTHLY MEAN MAGNETIC VALUES AND K-INDEXES, 1973

1973	D (E)	H nT	Z nT	F nT	K
Jan	06° 15.4'	36140	-23248	42972	2.43
Feb	15.5	135	254	971	2.50
Mar	15.6	130	255	967	2.60
Apr	15.7	114	260	957	2.83
May	16.0	120	263	963	2.35
Jun	16.1	116	269	963	2.30
Jul	16.0	124	270	970	1.94
Aug	16.2	123	275	972	2.05
Sep	16.5	122	277	972	2.10
Oct	16.7	118	283	972	2.26
Nov	16.2	120	284	974	2.04
Dec	16.4	117	291	976	1.92
Annual Mean	06° 16.0'	36123	-23269	42969	2.28

TABLE 14

GEOMAGNETIC ANNUAL MEAN VALUES, 1963-1973

Year	D	I	H	X	Y	Z	F	Notes
1963	06° 06.3'	-32 14.1'	36 379	36 173	3 869	-22 940	43 008	2B
1964	07.5	16.7	359	151	879	966	005	2B
1965	08.9	19.7	339	130	892	998	005	2B
1966	09.9	23.8	315	105	900	-23 043	009	2B
1967	10.5	26.2	284	073	903	059	42 991	2B
1968	11.4	30.2	256	045	909	100	990	2B
1969	12.3	33.8	233	021	916	139	991	2B
1970	13.1	36.6	200	35 987	921	160	975	2C
191	14.0	39.4	178	964	928	187	971	2C
1972	14.9	43.2	151	936	935	226	969	2C
1973	16.0	47.3	123	907	943	269	969	2C
Mean Annual Change	+0.97	-3.33	-25.6	-26.6	+7.4	-32.9	- 3.9	

NOTES 1 Final value

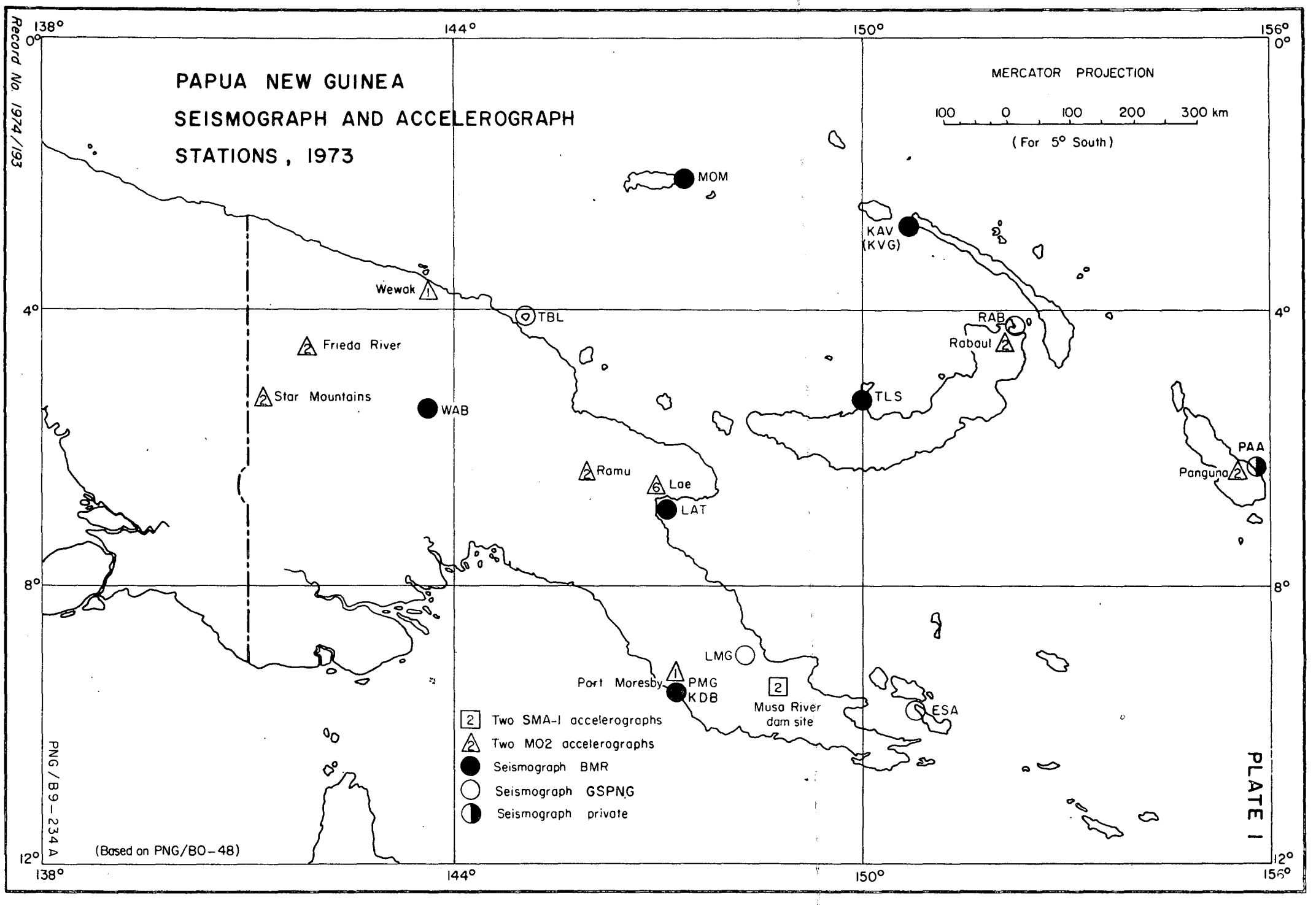
2 Preliminary value

B Mean hourly value based on 5 IQ days

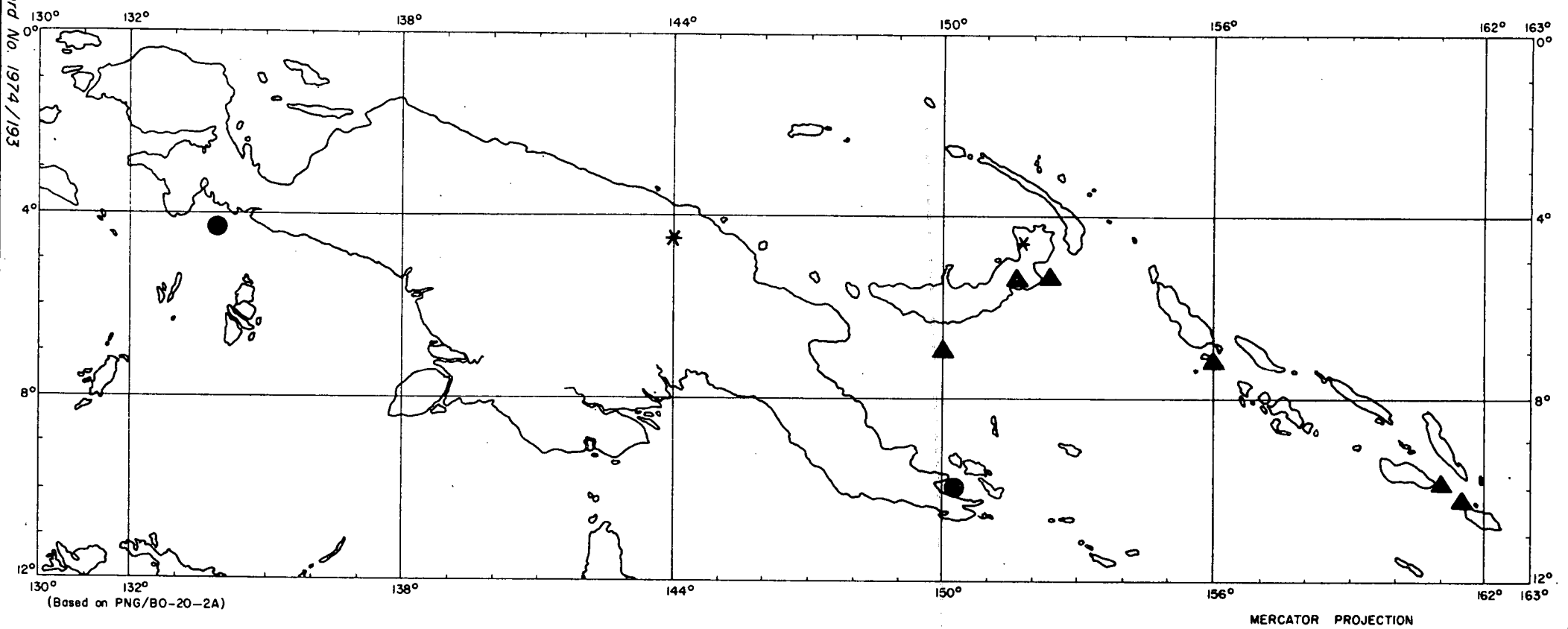
C Mean of daily value based on 10 Q days

Record No. 1974/193

PAPUA NEW GUINEA SEISMOGRAPH AND ACCELEROGRAPH STATIONS, 1973



Record No. 1974/193



EARTHQUAKES WITH MAGNETUDES EQUAL TO OR GREATER THAN M6 IN THE NEW GUINEA / SOLOMON ISLANDS REGION, 1973

(ERL HYPOCENTRES)

PLATE 2

PNG/B9-230 A