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Seismicity of the Territory of Papua & New Guinea 1966

by

D. Denham, W.M.J. Byrne, and J.R. Wilkie

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SUMMARY

1966 was seismically a comparatively quiet year in the Territory of Papua and New Guinea. Only four earthquakes occurred with magnitudes greater than six. The only significant earthquake damage reported during the year was on 23rd December 1966, when the SEACOM cable was damaged in the Huon Gulf. The shock which caused this effect was the largest originating in the Territory during 1966 and it occurred under the sea about 100 miles south-east of Lae.

1. INTRODUCTION

Data on the seismicity of the Territory of Papua and New Guinea up to the end of 1965 have been given by Brooks (1963) and in the Annual Reports of the Port Moresby Geophysical Observatory (see for example Denham, 1967).

In recent years the importance of earthquake risk in engineering projects has become most apparent. With the multi-million dollar projects by Conzinc Riotinto of Australia in Bougainville and Harrisons and Crossfield in New Britain and the overall increase in large European-type building structures the problem of earthquake risk has ceased to be merely an academic problem. It is now of great practical importance.

Port Moresby now has a twelve-storey office block in the town centre; in Lae a large three-storey building is to be erected to house the Territory's Higher Institute of Technology; at Goroka a two-million-dollar hospital is under construction and plans are being prepared for the construction of a 70-megawatt hydro-electric power station near Kainantu in the Eastern Highlands. Provided that the flow of capital into the Territory continues at about the same rate as at present, then projects such as these will become common, and the question of earthquake risk and earthquake insurance will become a significant factor in the economic development of the country.

Because of the growing interest in seismology and earthquake engineering in the Territory, it is now intended to produce annually a separate report which will catalogue all known earthquakes originating in the Territory and which will provide statistics on felt reports and any other relevant factors.

A total of eleven different seismic stations were occupied during 1966. Five were controlled by the Port Moresby Geophysical Observatory (PMG, DNG, KRG, LAE, TPN) and the other six by the Vulcanological Observatory at Rabaul. The instrumental constants, standard abbreviations of station names, geographical position, dates of operation, and other information are given in Tables 4 and 5.

2. EARTHQUAKE ANALYSIS

Epicentral locations

Table 1 lists all the earthquakes originating in the Territory of Papua and New Guinea that were recorded by enough stations for reliable epicentral determinations to be carried out by USCGS. Plate 1 shows the locations of all the earthquakes with magnitudes greater than 5 and also the position of the recording stations that were used in the Territory throughout the year.

Most of the earthquake data were abstracted from the monthly summaries of preliminary determinations of epicentres (PDE) produced by USCGS. In addition, 17 earthquakes, not included in the PDE reports have been incorporated in the list. These were obtained by examining the seismic bulletins from South Pole, Charters Towers, Brisbane, Warramunga, Port Moresby, Rabaul, and other local stations, and selecting events which were recorded by five or more stations but which had not been analysed by USCGS. A total of 71 such events were found during 1966, of which only 17 gave reliable solutions. The computations for these earthquakes were carried out by USCGS on request. The results from the other 54 events were unreliable mainly because all the recording stations were situated to the south of the earthquake. Until more stations are established on the New Guinea mainland and the neighbouring islands this situation will continue.

Magnitudes

Most of the magnitudes listed were obtained from the USCGS monthly summaries. Where no magnitude was listed the Port Moresby Wood-Anderson seismographs were used to obtain a usable value. Wood-Anderson seismographs were first used in California (Richter, 1958) to determine the magnitudes of local earthquakes on the so-called Richter scale. The formula used to evaluate magnitudes was

$$M_L = \log A - \log A_o \qquad (1)$$

where M_L is the Richter magnitude, A the maximum trace excursion in millimetres for a particular earthquake, and $\log A_o$ an empirical constant which depends on the epicentral distance of the earthquake. Logarithms are taken to the base 10.

It is not possible to apply equation (1) directly to the Port Moresby Wood-Andersons because their magnifications are slightly different from the standard instruments used by Richter. Furthermore the $\log A_o$ term which was applied in California does not necessarily apply in Papua and New Guinea. In general the Richter magnitude M_L will be given by

$$M_L = \tfrac{1}{2} \left\{ \log \left(\frac{Vwa}{Vt} \cdot A' \right)_N + \log \left(\frac{Vwa}{Vt} \cdot A' \right)_E \right\} - \log A_o' \qquad (2)$$

where Vwa is the magnification of the standard Wood-Anderson at period t,

Vt is the magnification of the Port Moresby instrument at period t,

A' is the maximum trace amplitude in millimetres,

$\log A'_o$ is an appropriate constant dependent on the distance of the earthquake, and

N and E refer to the north-south and east-west components respectively.

$\log A_o'$ will usually be different from $\log A_o$ because in equation (1) the amplitudes are measured centre-to-peak and in equation (2) peak-to-peak.

Substituting the results from the static magnification tests into equation (2) we get for the Port Moresby Wood-Andersons:

$$m_b\ (PMG) = \tfrac{1}{2} \left\{ \log (1.46A')_N + \log (1.73A')_E \right\} - \log A'_o \qquad (3)$$

The only unknown in this equation is the log A'_o term. To determine this factor and to make the Wood-Anderson magnitudes compatible with the body wave magnitudes m_b (CGS) determined by USCGS, the values of m_b (CGS) for most of the Territory earthquakes which occurred during 1964 and 1965 were substituted into equation (3) to give log A'_o in each case.

Over 90 earthquakes were used in the analysis and Table 2 gives the adopted values of log A'_o. There is a constant difference of about 0.7 between the constants given by Richter (loc cit) and those shown in Table 2. A difference of 0.3 between these tables is expected because A' is usually about twice A. The rest of the difference is due to the fact that equation (3) was solved for body wave magnitudes m_b and not Richter magnitudes M_L, and also because source and propagation conditions in California are probably considerably different from those in the Territory.

Using the constants in Table 2, body wave magnitudes were computed from the Wood-Anderson seismograms at Port Moresby. All the magnitudes listed in Table 1 which are asterisked have been calculated in this way.

Earthquake activity 1966

Compared with the previous eight years, 1966 was comparatively quiet. In fact, since 1958, only 1963 has been quieter. Four earthquakes occurred with a magnitude of six or greater; these are listed below and are also shown in Plate 1.

Date	Origin time			Lat. (°S)	Long. (°E)	Depth (km)	Magnitude m_b
Feb. 22	05	02	37.2	5.4	151.5	28	6.2
Apr. 1	05	21	09.7	5.8	149.1	112	6.1
Dec. 14	21	07	51.6	4.87	144.00	68	6.0
Dec. 23	15	50	21.6	7.13	148.32	53	6.4

The earthquake of 23rd December 1966 accounted for about half the seismic energy released in the Territory during 1966. Fortunately this earthquake occurred at sea under the Huon Gulf and was not a shallow event. Nevertheless it was felt with an intensity of V on the Modified Mercalli (MM) scale (see Appendix) at a distance of over 200 miles from the epicentre and it damaged the SEACOM cable which had just been laid in the vicinity of the epicentre.

The second largest shock (22nd February) occurred in East New Britain near Pomio. It was followed by over 12 after-shocks having magnitudes of 5 or above and gave rise to the highest reported felt intensity during the year (VII-VIII at Drina).

The April event was apparently not felt anywhere, but the shock of 14th December was felt over the whole of the New Guinea mainland from Finschhafen to the West Irian border. The maximum felt intensity was VI on the north coast of New Guinea near Wewak.

Plate 2 shows the depth distribution of earthquakes during 1966 and the energy distribution using the expression given by Richter (loc cit) for body wave magnitudes:

$$\log E = 5.8 + 2.4\, m_b \qquad (4)$$

Most of the energy was released in the 40 to 60-km depth range. The geographical location of the earthquakes follows trends similar to those outlined in previous years. The Pomio region of East New Britain was the most active, and the large number of shocks occurring in this locality is clearly shown in Plate 1. The deepest event was situated at a depth of about 510 km (Table 1, date 0828) about 50 miles north-east of Buka Island. The only other deep event was located at 415 km (date 0721) and was also situated near Buka Island.

Plate 3 is a histogram showing all the earthquakes occurring in the Territory during 1966 for which a magnitude determination was possible. This includes not only the events listed by USCGS but also all the shocks that produced a measurable deflection on the Wood-Anderson seismographs at Port Moresby. A total of 426 earthquakes were examined in this way. As can be seen from the diagram, the well-known relationship (Richter, loc cit)

$$\log N = a - bM \qquad (5)$$

holds down to magnitude 5. In this expression N is the number of earthquakes in the magnitude range $M \pm \Delta M$, where $2\Delta M$ is 0.5, and a and b are constants.

Many earthquakes below magnitude 4 are not detected. Plate 3 indicates that, assuming equation(5)holds, over 200 shocks in the magnitude range 4.5 to 5.0, and over a thousand in the 4.0 to 4.5 range, were not recorded well enough to be included in the analysis. There is evidently a great need for more seismic recording stations within the Territory if all the shocks down to magnitude 4 are to be properly located.

3. FELT INTENSITY MEASUREMENTS

In August 1966 the earthquake questionnaire form shown in Plate 9 was distributed to nearly 400 observers over the whole of the Territory. The aim was to build up a reliable catalogue of felt reports which could be used as an aid to defining seismic risk zone. From the engineering view-point, intensity measurements by themselves are difficult to evaluate because the data obtained cannot be easily related to definite accelerations or velocities. Many factors such as the spectrum of the original earthquake, the response of the ground, the response of the buildings, and the like have to be considered before an accurate quantitative evaluation of the situation can be made.

In the near future it is hoped that accelerometers will be set up at several sites in active seismic zones and then it will be possible to examine the relationship between intensity observations and accelerations. In the meantime, felt reports have to be relied upon for all earthquake risk evaluations.

Initially the Modified Mercalli intensity scale (see Appendix) is being used but this only applies to European-type communities and is to a certain extent inapplicable to the Territory of Papua and New Guinea.

The establishment and operation of an adequate network of reliable felt intensity reporting stations in one of the most rugged inhabited countries in the world, with a mainly illiterate population, poses many difficulties:

1. The population distribution is very uneven, with the highest concentrations in the New Guinea Highlands and the northern part of the island of New Britain. The lack of reporting stations in areas such as between the New Guinea Highlands and the Sepik River seriously affects the drawing of isoseismals for earthquakes in this active seismic region.

2. Buildings with more than twelve storeys do not exist at present in the Territory of Papua New Guinea and consequently the detection of MM I and II is almost impossible. Such effects as long-period oscillation of branches of trees are unlikely to be observed. Reference to traffic, windows, furniture, glassware, crockery, hanging pictures, pendulum clocks, bells, tanks, chimneys, masonry rails, etc. is, except for the European settlements, irrelevant in a Territory intensity scale.

   Native constructions vary considerably throughout, from huts on stilts over the water to low thatch grass dwellings. All are likely to be very flexible as much use is made of bamboo, and are unlikely to suffer earthquake damage except in severe shocks. An intensive study would be required to determine a felt intensity scale corresponding to such constructions.

3. Almost total illiteracy of the native population severely restricts the distribution of reporting stations. The staff of Administration offices have a heavy work load and are often out on patrol, but they are usually the only personnel who are sufficiently responsible to complete a simple questionnaire. Even Mission and Native Primary School teachers have some difficulty in filling out the questionnaire.

4. Territory communications to remote locations are very sporadic and letters often take several weeks to reach their destination, especially to patrol posts without an air strip nearby. Between Port Moresby and Bougainville an airmail letter can take at least a week.

   Telephone and phonogram services link the main centres but often only a morning and afternoon schedule is operative and contact is sometimes intermittent. It is often impossible to obtain rapidly any information about possible damage.

Since the intensity programme began, an earthquake inspection of the damage has not occurred, but, depending on the site, extreme difficulty may be encountered in obtaining firstly a preliminary on-site description and also in getting to and inspecting the site in rugged country. It is likely that an aerial inspection of landslides etc. would be all that could be achieved in many instances.

The earthquake questionnaire form shown in Plate 9 was designed to be as simple as possible and yet achieve a maximum amount of information. Most questions can be answered simply by underlining the most suitable word, but space is left for comment. Since the questionnaire is mostly completed by Europeans, European-type building materials and furnishings are emphasised. Business reply-post envelopes are forwarded with each questionnaire. Initially about 150 Department of District Administration offices in all districts were supplied with the questionnaire, and shortly afterwards Administration and Mission schools were included, giving a total number of reporting centres of 380 throughout the Territory. The response to the project has been satisfactory considering the amount of work Administration officers have to perform and also the lack of understanding by native school teachers.

Table 3 presents a chronological list of felt reports for 1966. Included in the list are felt intensities reported to the Rabaul Vulcanological Observatory, which operates a felt intensity network for the purpose of monitoring tremors caused by volcanic activity.

Plates 4 to 8 show the felt intensities for six of the more widely felt earthquakes during 1966.

Three areas seem to be particularly susceptible to earthquake damage; these are the Markham River valley, the area between Wewak and the Sepik River mouth, and East New Britain.

The isoseismal pattern of the shock of 26th February 1963 (Observatory Staff, 1967, Plate 1) indicated that the sedimentary area around Popondetta would be prone to earthquake damage, but although the pattern of the earthquake of 23rd December 1966 (Plate 8) was elongated to the south and east, higher intensities were not felt in the Popondetta area. A further interesting feature of the latter earthquake is the rapid decrease in felt intensity across New Britain. This earthquake damaged the SEACOM cable linking Madang and Australia.

Generally the direction of felt motion was random, but in the case of the earthquake of 14th December 1966 (Plate 7) stations in the Prince Alexander Mountains region to the north-west of the epicentre reported NE-SW motion indicating that the S wave was felt most strongly.

Noise accompanying earthquakes has been reported from intensities of two and upwards, and mainly sounds like "rolling a galvanised iron tank".

With the continued co-operation of District Administration officers and school teachers a much more detailed earthquake response pattern should be available in the future.

4. CONCLUSIONS AND RECOMMENDATIONS

This report is an attempt to put on to a systematic basis the analysis of earthquakes and their effects in the Territory of Papua and New Guinea. It shows that the New Guinea region of the Territory is part of a very highly seismic area where earthquake risk should always be considered in any building project.

Instrumentation for the recording of earthquakes expanded greatly in 1966 with the establishment of reliable outstations at Esa'Ala, Lae, Tabele, and other centres. However, with the locations unknown for over a thousand earthquakes with magnitudes greater than 4, the recording network can hardly be considered adequate. Stations are urgently required on the New Guinea mainland and on New Britain and Bougainville if a proper evaluation of the seismicity of the area is to be obtained.

There is also a need for strong motion equipment to be installed in areas of high seismic risk where building projects are planned. Most of the New Guinea centres such as Rabaul, Lae, Madang, and Wewak are developing areas where the earthquake risk is high. A network of strong motion equipment should be installed as soon as practicable.

5. ACKNOWLEDGEMENTS

The results contained in this report would not have been possible without the help and co-operation of many outside bodies. The authors would particularly like to thank:

1. The USCGS for special earthquake epicentral determinations.

2. The Rabaul Vulcanological Observatory for supplying many of the felt reports listed and the data on the instrumentation of the stations operated by the Central Observatory, Rabaul.

3. The many volunteer reporters who have co-operated most enthusiastically in our scheme to record felt effects of earthquakes throughout the Territory.

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APPENDIX

MODIFIED MERCALLI INTENSITY SCALE OF 1931

(Abridged and rewritten)

I. Not felt. Marginal and long-period effects of large earthquakes.

II. Felt by persons at rest, on upper floors, or favourably placed.

III. Felt indoors. Hanging objects swing. Vibration like passing of light trucks. Duration estimated. May not be recognised as an earthquake.

IV. Hanging objects swing. Vibration like passing of heavy trucks; or sensation of a jolt like a heavy ball striking the walls. Standing motor cars rock. Windows, dishes, doors rattle. Glasses clink. Crockery clashes. In the upper range of IV wooden walls and frame creak.

V. Felt outdoors; direction estimated. Sleepers wakened. Liquids disturbed, some spilled. Small unstable objects displaced or upset. Doors swing, close, open. Shutters, pictures move. Pendulum clocks stop, start, change rate.

VI. Felt by all. Many frightened and run outdoors. Persons walk usteadily. Windows, dishes, glassware broken. Knicknacks, books, etc., off shelves. Pictures off walls. Furniture moved or overturned. Weak plaster and masonry D cracked. Small bells swing (church, school). Trees, bushes shaken.

VII. Difficult to stand. Noticed by drivers of motor cars. Hanging objects quiver. Furniture broken. Damage to masonry D, including cracks. Weak chimneys broken at roof line. Fall of plaster, loose bricks, stones, tiles, cornices. Some cracks in masonry C. Waves on ponds; water turbid with mud. Small slides and caving in along sand or gravel banks. Large bells ring. Conrete irrigation ditches damaged.

VIII. Steering of motor cars affected. Damage to masonry C; partial collapse. Some damage to masonry B; none to masonry A. Fall of stucco and some masonry walls. Twisting, fall of chimneys, factory stacks, monuments, towers, elevated tanks. Frame houses moved on foundations if not bolted down; loose panel walls thrown out. Decayed piling broken off. Branches broken from trees. Changes in flow or temperature of springs and wells. Cracks in wet ground and on steep slopes.

IX. General panic. Masonry D destroyed; masonry C heavily damaged, sometimes with complete collapse; masonry B seriously damaged. Frame structures, if not bolted, shifted off foundations. Frames cracked. Serious damage to reservoirs. Underground pipes broken. Conspicuous cracks in ground. In alluviated areas sand and mud ejected, earthquake fountains, sand craters.

X. Most masonry and frame structures destroyed with their foundations. Some well-built wooden structures and bridges destroyed. Serious damage done to dams, dikes, embankments. Large landslides. Water thrown on banks of canals, rivers, lakes, etc. Sand and mud shifted horizontally on beaches and flat land. Rails bent slightly.

XI. Rails bent greatly. Underground pipelines completely out of service.

XII. Damage nearly total. Large rock masses displaced. Lines of sight and level distorted. Objects thrown into the air.

TABLE 1

Papua New Guinea Earthquakes 1966

(Epicentres located within range 0^{o}-10^{o}S and 140^{o}-156^{o}E)

Date	Origin time (U.T.)			Lat (°S)	Long (°E)	Depth (km)	Magnitude m_b	Felt reports (and intensity)
0101	12	24	30.3	9.8	154.7	33	5.6	
0101	16	10	20.5	9.7	154.8	07	5.1	
0102	03	25	32.8	6.4	148.6	52	4.6	
0106	04	54	52.5	5.0	147.5	100	4.4*	
0107	14	57	43.7	5.2	152.6	47	5.3	
0110	16	12	14.7	6.6	154.6	64	5.9	Buin (II-III)
0111	09	51	47.0	6.8	155.2	75	4.6	Buin (II-III) Torokina (II)
0114	07	39	13.2	5.9	148.3	88	5.4	
0116	09	22	19.3	5.3	147.0	204	4.6	
0116	14	30	44	4.9	142.6	104	4.7*	
0118	08	00	05.7	5.3	153.4	48	4.9*	
0120	18	38	40.7	5.7	152.1	13	4.6*	
0204	22	14	42.3	7.1	155.1	88	5.0	
0205	23	14	25.3	7.1	155.4	70	5.0	Torokina (III)
0207	12	22	40.2	5.6	146.3	47	5.3	
0210	15	51	23.4	5.2	150.6	155	5.3	
0212	20	15	14.6	3.8	152.2	33	4.8*	Rabaul (III) Londolovit (III)
0212	23	37	54.2	3.7	152.0	36	5.5	
0222	05	02	37.2	5.4	151.5	28	6.2	Drina (VII-VIII) Rabaul (VII) Malmalmal (VI-VII) Bialla (V-VI) Kokopo (IV-V) Karlai (IV), etc.
0222	05	57	10.1	5.5	151.8	55	5.0	
0222	06	25	55.6	5.6	151.4	51	4.5*	
0222	17	24	09.7	5.6	151.5	55	4.9	
0222	18	18	36.4	5.6	151.5	58	5.5	
0222	18	43	11.8	5.5	151.4	59	5.3	Kokopo (II)
0222	19	26	52.0	5.5	151.4	64	4.9	
0224	04	17	38.0	4.3	150.7	96	4.4*	
0224	08	45	32.2	5.5	151.8	59	4.4	
0224	20	08	57.0	6.1	147.4	59	5.5	
0226	05	34	28.1	4.9	151.1	51	4.8	
0226	06	50	23.0	5.4	151.7	59	5.1	
0227	20	25	36.3	5.8	148.5	123	5.0	
0301	00	57	45.1	3.0	147.7	21	5.0	
0302	20	13	33.5	5.5	151.8	48	5.2	Rabaul (III)
0304	04	10	08.6	5.4	151.7	56	4.8	Pomio (I)

Date	Origin time (U.T.)			Lat (°S)	Long (°E)	Depth (km)	Magnitude m_b	Felt reports (and intensity)
0314	19	34	24.4	4.0	152.9	19	4.1*	Londolovit (III) Rabaul (II)
0315	23	09	33.9	2.6	140.3	33	4.8	
0316	10	58	53.9	6.2	149.1	56	5.0	
0316	14	57	40.7	3.0	153.6	33	--	
0317	08	19	17.5	4.7	148.4	181	5.1*	
0321	16	00	21.7	2.6	140.3	16	5.5	
0321	19	44	13.8	2.8	140.5	33	4.9	
0324	13	03	40.2	2.6	140.4	13	5.0	
0324	17	33	46.7	1.7	149.5	42	4.7	
0326	22	13	22.2	5.7	149.3	110	5.0	
0329	18	29	09.9	3.5	145.2	33	4.4*	
0330	13	13	45.7	4.7	153.0	78	4.6	
0401	05	21	09.7	5.8	149.1	112	6.1	
0402	11	01	37.8	3.6	151.1	23	4.5	
0403	07	38	40.9	8.4	156.4	62	4.8	Salamo (II)
0404	06	17	45.1	5.5	151.6	47	5.3	Rabaul (III)
0404	10	30	26.9	5.5	151.7	56	5.3	Rabaul (II)
0405	18	59	54.1	5.9	147.6	61	5.2	
0406	17	02	39.4	4.1	152.0	199	5.1	
0407	16	26	41.9	5.9	152.5	64	4.9	
0407	17	15	42.5	5.6	151.7	58	5.2	
0408	10	32	06.9	8.2	156.4	31	5.1	
0414	08	08	01.4	5.2	141.5	15	4.6*	Telefomin (IV)
0414	19	16	00.6	3.8	151.4	33	5.1	
0421	22	45	18.0	4.5	152.0	118	5.3	Rabaul (I)
0423	05	57	12.0	4.4	144.1	100	4.9	
0425	04	57	52.3	5.8	148.9	125	5.4*	
0501	10	50	52.8	4.5	153.5	102	4.8	
0501	12	57	12.2	3.6	143.0	21	4.9*	Yangoru (II-III)
0501	13	14	47.4	3.5	143.0	33	5.3*	Lumi (II)
0501	23	24	15.9	4.3	144.3	139	4.7	
0502	09	52	48.5	6.0	149.7	52	5.2	Walindi (IV)
0502	11	23	58.8	6.2	150.0	65	4.5	
0513	05	02	14.7	7.2	146.3	177	4.5*	
0515	03	38	10.2	5.2	152.2	56	4.7	
0517	05	40	19.7	5.7	151.6	56	5.0	
0519	11	38	25.7	5.2	153.7	48	4.1*	
0521	19	05	17.0	5.3	153.2	81	4.5	
0522	02	52	12.7	7.4	155.5	83	5.6	Buin (IV-V)
0522	03	25	19.8	7.4	155.7	100	5.3	Buin (III)
0522	21	36	37.4	6.4	147.0	110	4.7	
0523	00	02	49.5	7.4	155.8	111	5.4	
0525	07	42	44.7	4.8	153.2	104	5.3*	
0526	11	38	17.9	5.6	151.5	50	5.0*	Rabaul (II)
0528	22	23	45.3	4.4	153.4	122	5.4	
0529	15	20	54.0	4.6	153.7	95	4.8	Londolovit (II)
0601	03	48	49.2	5.8	151.2	61	5.5	Palmalmal (IV-V)
0606	00	52	08.8	2.7	150.6	33	4.6	

Date	Origin time (U.T.)			Lat (°S)	Long (°E)	Depth (km)	Magnitude m_b	Felt reports (and intensity)
0606	10	10	13.0	6.4	153.2	16	4.5*	
0607	05	58	50.5	5.1	151.1	146	4.6	
0608	21	21	52.2	6.1	147.5	61	4.7*	
0610	12	15	05.7	6.1	149.8	53	5.0	
0617	15	06	26.7	6.2	146.7	77	5.4	
0618	00	30	01.0	2.8	141.6	33	5.0	
0618	19	15	24.4	3.3	143.2	17	5.2	
0619	07	52	20.2	8.8	149.5	54	5.4	Losuia (I-II)
0620	04	14	39.0	5.4	151.8	57	4.5*	
0621	13	32	48.8	5.2	144.6	42	5.5	
0621	16	18	18.3	5.3	145.5	95	4.7	
0622	19	13	48.6	6.4	146.4	121	5.3	
0624	02	57	02.5	6.3	155.0	155	5.6	Piva (IV)
0624	07	24	27.0	5.3	146.9	181	4.4*	
0625	18	38	35.7	5.0	151.4	123	5.6	
0628	01	49	59.2	5.6	146.4	32	5.0	Saidor (III-IV)
0630	07	49	42.4	5.7	146.8	61	4.7	Saidor (II-III)
0705	01	17	41.8	5.5	147.5	162		
0705	14	39	09.3	5.8	151.1	65	4.8	
0706	03	44	45.6	3.2	142.2	27	4.8	
0707	17	15	02.2	6.2	154.5	46	-	
0717	06	48	27.6	5.5	153.6	72	5.0	
0719	11	51	48.1	4.8	143.1	104	5.3	Kiunga (II-III) Telefonin (IV) Tari (III) Erave (II-III) Tsumba (II)
0719	14	58	20.1	4.8	144.2	55	5.2	
0721	05	23	51.1	5.0	154.3	415	5.0	
0721	13	11	16.9	3.4	141.0	39	4.2*	Pagei (V)
0725	20	50	35.9	6.0	150.7	56	4.6	
0726	05	40	05.0	5.9	147.4	65	4.7*	
0728	08	15	13.8	2.3	141.2	19	5.4	
0805	15	38	12.1	5.4	153.6	80	5.6	
0805	16	44	44.6	4.9	153.2	86	4.4*	
0810	12	33	42.2	5.5	151.8	40	5.3	Rabaul (III)
0810	13	07	18.5	5.4	151.7	63	5.1	Rabaul (II)
0810	15	57	40.0	5.5	151.7	55	5.5	
0811	17	47	14.0	5.4	147.2	34	4.3*	
0812	16	49	00.0	5.3	152.0	73	5.2*	
0820	23	36	00.0	5.0	144.4	88	4.5*	Minj (III)
0821	07	05	01.7	5.8	153.8	68	5.0*	
0826	12	01	17.8	7.3	147.6	68	5.1	Morobe (II-III)
0827	10	37	37.0	5.2	149.9	135	4.4*	
0828	10	03	03.0	4.6	155.2	509	5.6	
0901	20	36	48.9	5.4	153.4	80	4.3*	
0905	06	52	51.1	7.5	155.9	60	5.2	
0907	05	53	45.7	8.7	156.5	52	5.3	
0907	15	55	11.5	5.1	154.7	77	5.5	Wakunai (III) Tinputz (III)

Date	Origin time (U.T.)			Lat (°S)	Long (°E)	Depth (km)	Magnitude m_b	Felt reports (and intensity)
0911	07	03	18.1	6.3	147.3	78	5.3	Wau(II-III)
								Chauve (III)
0916	03	52	02.0	6.0	147.0	87	4.4*	
0917	18	59	53.3	4.1	142.8	117	3.9*	
0919	06	06	37.8	3.7	144.2	19	5.2	
0920	11	49	36.4	5.9	145.8	106	5.2*	Bundi (IV)
								Kainantu (III)
								Chauve (III)
								Henganofi (II)
								Kundiawa (II-III)
0923	04	51	48.3	8.7	157.3	39	4.9	
0927	05	49	02.5	5.9	151.0	55	4.4*	
0927	19	15	26.8	5.1	151.9	68	4.9	
1001	07	52	23.6	5.5	149.4	152	4.8*	
1003	21	54	21.9	3.4	140.3	33	4.3*	
1006	03	11	03.3	6.2	146.4	113	5.5	Ion-onka (III-IV)
								Arau (V)
								Kompri (III-IV)
								Kalalo (III-IV)
								Aiyura (III-IV)
								Chevasing (III-IV)
1006	11	16	04.9	3.9	139.9	34	5.2	
1007	16	33	28.3	5.6	147.3	169	4.5*	
1007	19	55	26.4	5.5	146.2	163	4.3*	
1007	23	04	08.1	4.4	143.1	95	5.3	Ambunti (IV)
								May River (III-IV)
								Mande (III-IV)
								Mendi (III-IV)
1014	07	35	11.4	6.0	154.6	224	4.5	
1015	02	20	40.6	4.8	153.5	86	4.8*	
1016	13	18	19.6	4.8	153.2	105	5.3	Rabaul (IV-V)
1017	20	29	01.6	4.2	143.4	100	5.1	
1020	13	17	23.4	5.2	151.6	88	4.9	Malabunga (III)
								Wapet (III)
1020	15	03	46.9	3.5	146.1	34	5.2	
1021	15	04	44.6	7.1	146.0	179	5.0	
1022	03	45	04.1	6.8	147.6	59	4.8	Chevasing (III)
								Pindiu (II)
								Wantoat (II)
1023	09	15	48.2	6.5	155.2	34	5.0	
1025	00	26	36.5	5.6	147.2	67	5.3	Lae (IV)
								Babwump (IV-V)
								Sangan (IV)
								Mumeng (IV)
								Arau (IV)
								Obura (IV)
1026	18	28	58.2	4.2	152.9	57	4.9	Mioko Is (IV)
								Kokopo (III-IV)
								Malabunga (III)
								Rabaul (III-IV)

Date	Origin Time (U.T.)	Lat (°S)	Long (°E)	Depth (km)	Magnitude m_b	Felt reports (and intensity)
1027	22 26 20.5	7.4	146.9	137	5.1	
1029	07 08 27.8	6.8	155.7	67	5.0*	Konga (III-IV)
1029	22 35 25.6	7.5	156.7	107	4.6*	
1102	20 00 11.3	6.2	153.6	34	4.6	
1105	09 37 40.5	5.7	146.9	147	4.2*	
1105	10 46 06.2	6.0	151.6	64	5.0	Londolovit (II)
1106	01 28 35.5	4.7	153.0	68	5.0	Londolovit (II) Malabunga (II)
1107	20 26 15.7	5.9	152.2	50	5.0	
1115	20 05 30.8	3.0	141.6	33	4.0*	Imonda (III)
1116	02 26 08.6	6.2	153.3	72	4.9	Pagei (II)
1116	03 39 46.0	6.6	147.3	80	4.8	
1118	08 02 45.9	5.8	152.2	47	4.8	
1119	06 56 38.8	4.3	144.1	154	4.6*	
1119	14 50 19.2	5.6	147.2	157	4.7*	
1120	04 21 51.5	6.4	153.8	128	5.0	
1122	04 11 37.4	5.8	152.2	58	4.9	
1125	20 57 56.7	8.4	147.7	14	4.5	
1128	03 04 09.9	5.4	151.3	74	4.6	Malabunga (III) Pomio (III) Rabaul (II)
1128	08 17 10.1	7.4	154.8	13	5.0	
1129	06 32 06.7	6.6	154.3	114	4.2*	
1201	09 49 41.6	4.9	151.5	178	4.2*	
1204	23 23 22.3	6.4	154.4	87	4.7	
1209	14 54 43.3	4.1	143.7	63	5.2	Mande (III) Kreer (III)
1210	18 08 14.4	3.6	145.4	33	5.7	
1214	21 07 51.6	4.87	144.0	68	6.0	Kaup (VI) Kundiawa (V) Koroba (V-VI) Wewak (V-VI) Minj (V-VI) Aiome (V-VI),etc.
1215	09 26 52.6	5.8	147.2	91	5.0	
1215	14 32 20.7	5.5	147.4	179	5.0	
1218	09 43 55.8	5.4	146.2	60	4.3*	
1221	01 12 45.2	6.7	154.9	89	4.8	
1223	15 50 21.6	7.13	148.32	53	6.4	Pindiu (VI) Kabwum (V-VI) Kwikila (V-VI),etc.
1225	14 26 31.7	4.8	152.1	106	5.0	
1225	15 42 04.5	7.9	145.2	33	3.8*	
1225	20 21 53.9	1.8	150.1	48	4.7	
1226	01 08 23.9	5.9	148.1	120	5.0	
1227	05 42 17.2	5.9	145.4	79	4.8	
1231	12 09 13.8	7.1	148.6	53	4.1*	

* See page 3

TABLE 2

Values of log A_o for local earthquakes

Δ°	-Log A'_o	A°	-Log A'_o	Δ°	-Log A'_o	Δ°	-Log A'_o
1.0	2.4	3.0	3.4	5.0	4.2	7.0	4.7
1.1	2.4	3.1	3.5	5.1	4.2	7.1	4.7
1.2	2.5	3.2	3.5	5.2	4.3	7.2	4.8
1.3	2.6	3.3	3.6	5.3	4.3	7.3	4.8
1.4	2.6	3.4	3.6	5.4	4.3	7.4	4.8
1.5	2.7	3.5	3.7	5.5	4.3	7.5	4.8
1.6	2.7	3.6	3.7	5.6	4.4	7.6	4.8
1.7	2.8	3.7	3.8	5.7	4.4	7.7	4.9
1.8	2.8	3.8	3.8	5.8	4.4	7.8	4.9
1.9	2.9	3.9	3.9	5.9	4.4	7.9	4.9
2.0	3.0	4.0	3.9	6.0	4.5	8.0	4.9
2.1	3.0	4.1	3.9	6.1	4.5	8.1	
2.2	3.0	4.2	4.0	6.2	4.5	8.2	
2.3	3.1	4.3	4.0	6.3	4.5	8.3	
2.4	3.1	4.4	4.0	6.4	4.6	8.4	
2.5	3.2	4.5	4.1	6.5	4.6	8.5	
2.6	3.2	4.6	4.1	6.6	4.6	8.6	
2.7	3.3	4.7	4.1	6.7	4.6	8.7	
2.8	3.4	4.8	4.2	6.8	4.7	8.8	
2.9	3.4	4.9	4.2	5.9	4.7	8.9	

$$-\text{Log } A'_o = m_b \text{ (CGS)} - \tfrac{1}{2} \left(\log (1.46A')_N + \log(1.73A')_E\right)$$

A' = maximum peak-to-peak trace amplitude in mm

Δ ° = Epicentral distance in degrees

TABLE 3

Papua New Guinea Felt Reports 1966

Date	Time (U.T.)	Locality	Lat (°S)		Long (°E)		Inten-sity
0101	0200	Pomio	05°	30'	151°	30'	I
0110	1547	Buin	06	51	155	44	II-III
0111	0953	Buin	06	51	155	44	II-III
	0955	Torokina	06	14	155	03	II
	1615						III
0114	0230	Pomio	05	30	151	30	II
	0740	Rabaul	04	10	152	10	I
0115	0500	Pomio	05	30	151	30	I-II
	0630		05	30	151	30	I-II
0116	0155	Pomio	05	30	151	30	I
	1315	Dreikikir	03	34	142	47	II-III
0117	0035	Maprik	03	38	143	03	III
0124	1530	Dreikikir	03	34	142	47	IV
0201	0225	Torokina	06	14	155	03	II
	2340	Amanab	03	30	141	20	II
0205	0415	Torokina	06	14	155	03	II
	2215						III
		Buin	06	51	155	44	II-III
0206	2313	Torokina	06	14	155	03	III
	2315	Buin	06	51	155	44	III
	0935	Wonenara	06	50	145	55	II
	1125						II
	2318	Walindi	05	25	150	05	III
0212	2010	Londolovit	03	10	152	40	III
	2015	Rabaul	04	10	152	10	III
	2138						II
0214	1728	Rabaul	04	10	152	10	III
0215	0439	Lumi	03	29	142	01	II
0222	0501	Pomio	15	30	151	30	II
	0502	Kokopo	04	20	152	15	IV-V
		Torokina	06	14	155	03	III
	0503	Drina	05	70	151	40	VII-VIII
		Bialla	05	19	151	02	V-VI
	0505	Rabaul	04	10	152	10	VII
		Malmalmal	05	37	151	28	VI-VII
	0505	Karlai	05	05	152	00	IV
	1530	Londolovit	03	10	152	40	I
0223	1845	Kokopo	04	20	152	15	II
0224	1200	Kainantu	06	18	145	52	IV
	1245	Wonenara	06	50	145	55	I
	1940	Kokopo	04	20	152	15	II
0225	2006	Wonenara	06	50	145	55	II-III
	2010	Kilenge	05	30	148	20	II
		Kainantu	06	18	145	52	IV
	2015	Goroka	06	05	145	25	I

Date	Time (U.T.)	Locality	Lat (°S)		Long (°E)		Intensity
0225	2130	Esa 'Ala	09°	45'	150°	49'	II
0228	0000	Bwagaoia	10	40	152	50	I
0302	0430	Saidor	05	38	146	28	I
	0706	Pomio	05	30	151	30	II
	0729	Rabaul	04	10	152	10	III
	0730	Bialla	05	19	151	02	II
	2013	Rabaul	04	10	152	10	III
0303	2024	Pomio	05	30	151	30	III-IV
	2200						II
0304	0411	Pomio	05	30	151	30	I
	1240						I
	2311						I
0308	1200						II
0309	1230						II
0314	1934	Rabaul	04	10	152	10	II
	1940	Londolovit	03	10	152	40	III
0315	1630	Londolovit	03	10	152	40	I
	1940						III
0323	1915	Londolovit	03	10	152	40	I
0328	2315	Buin	03	10	152	40	II-III
0330	0030	Pomio	05	30	151	30	II
	0115	Londolovit	03	10	152	40	III-IV
	0122						I
0331	0543	Londolovit	03	10	152	40	I-II
0403	0700	Salamo	09	40	150	50	II
0404	0618	Rabaul	04	10	152	10	III
	1030						II
0414	0459	Rabaul	04	10	152	10	II
	0808	Telefomin	05	10	141	35	IV
	1152						III-IV
	1739						II-III
0415	1723	Telefomin	05	10	141	35	IV-V
	1738						III-IV
	1759						IV-V
0418	0150	Esa 'Ala	09	45	150	50	IV
	0200	Salamo	09	40	150	50	II
0419	0150	Esa 'Ala	09	45	150	50	II
0421	2245	Rabaul	04	10	152	10	I
0501	0005	Londolovit	03	10	152	40	I
	0015	Tsumba	04	43	144	40	I-II
	1048	Londolovit	03	10	152	40	II
	1245	Yangoru	03	40	143	18	II-III
	1315	Lumi	03	29	142	01	II
	1330	Yangoru	03	40	143	18	II-III
	2230	Londolovit	03	10	152	40	II
0502	0953	Walindi	05	25	140	05	IV
	1000	Talasea	05	20	150	05	III
		Palmalmal	05	37	151	28	III
		Cape Gloucester	05	24	148	45	III
	0952	Kilenge	05	30	148	20	II

Date	Time (U.T.)	Locality	Lat (°S)		Long (°E)		Intensity
0502	0953	Rabaul	04°	10'	152°	10'	II
	2326	Tsumba	04	43	144	40	II-III
0510	0957	Tsumba	04	43	144	40	II-III
0512	1226	Tsumba	04	43	144	40	II
0517	0540	Rabaul	04	10	152	10	I
0522	0253	Buin	06	51	155	44	IV-V
	0326						III
0524	0116	Kieta	06	13	155	39	III
0526	1138	Rabaul	04	10	152	10	II
0529	2245	Londolovit	03	10	152	40	II
0530	1915	Goroka	06	05	145	25	II
0531	1630	Wonenara	06	50	145	55	II
0601	0320	Pomio	05	30	151	30	I-II
	0349	Rabaul	04	10	152	10	I
		Palmalmal	05	37	151	28	IV-V
0609	2300	Saidor	05	38	146	28	II
0614	1208	Piva	06	14	155	03	III
	1515						III
0619	0755	Cameron Plateau	10	20	150	25	II
	0800	Losuia	08	30	151	05	I-II
	1945	Salamo	09	40	150	50	II
0620	0430	Pomio	05	30	151	30	II-IV
0621	1630	Goroka	06	05	145	25	III
0622	1540	Kainantu	06	18	145	52	III
0623	1930	Goroka	06	05	145	25	II
0624	0257	Piva	06	14	155	03	IV
0628	0145	Saidor	05	38	146	28	III-IV
	0210						I-II
0630	0755	Saidor	05	38	146	28	II-III
0706	0345	Lumi	03	29	142	01	III
0708	1950	Londolovit	13	10	152	50	II
0713	0544	Lamerika	03	12	151	55	II
0717	1012	Dreikikir	03	34	142	47	I
	1113	Tsumba	04	43	144	40	II
0718	1545	Londolovit	03	10	152	50	III
0719	1148	Kiunga	06	05	141	18	II-III
	1150	Tari	05	52	142	57	III
	1152	Telefomin	05	10	141	35	IV
	1153	Erave	06	38	143	52	II-III
		Tsumba	04	43	144	40	II
	1612	Londolovit	03	10	152	50	III
0721	1225	Amanab	03	30	141	20	III
	1311	Pagei	03	02	141	10	V
0726	1535	Rabaul	04	10	152	10	IV
	1630	Londolovit	03	10	152	50	I
0809	1814	Rabaul	04	10	152	10	II
	1959						III
0810	0400	Bundi	05	45	145	15	III
	1234	Rabaul	04	10	152	10	III

Date	Time (U.T.)	Locality	Lat (°S)		Long (°E)		Intensity
0810	1307	Rabaul	4°	10'	152°	10'	II
0820	2336	Minj	05	55	144	41	III
0824	1815	Sissano	03	00	142	02	II
0826	1121	Torokina	06	14	155	03	II
	1200	Morobe	07	45	147	37	II-III
0829	1925	Torokina	06	14	155	03	II
0904	1615	Erave	06	38	143	52	II-III
0907	1555	Wakunai	05	51	155	13	II-III
	1600	Tinputz	05	33	154	59	III
0911	0703	Wau	07	19	146	43	II-III
	0705	Chuave	06	08	145	08	III
	1150	Goroka	06	05	145	25	II
1917	1200	Arau	06	23	146	02	IV-V
0918	1556	Lamerika	03	12	151	55	IV
	1600	Lemeris	02	16	152	02	III
0920	1145	Bundi	05	45	145	15	IV
	1150	Kainantu	06	18	145	52	III
	1151	Chuave	06	08	145	08	III
	1155	Henganofi	06	15	145	38	II
		Kundiawa	06	17	145	53	II-III
0926	1210	Londolovit	03	10	152	40	II
0927	0549	Rabaul	04	10	152	10	I
0930	1057	Kalolo	05	59	147	12	IV
	1200	Saidor	05	38	146	29	II
1001	0410	Buin	06	50	155	45	II
	1500	Imonda	03	20	141	08	II
1005	2230	Buin	06	50	155	45	III-IV
1006	0300	Ino-onka	06	13	145	47	III-IV
1006	0308	Henganofi	06	15	145	38	II-III
	0311	Punano	06	05	145	53	II-III
	0312	Gabari	06	38	146	58	II
	0310	Chevasing	06	38	146	34	III-IV
	0312	Wau	07	19	146	43	III
		Aiyura	06	20	145	56	III-IV
	0314	Kalalo	05	59	147	12	III-IV
	0315	Kompri	06	14	145	43	III-IV
		Arau	06	23	146	02	V
1007	2306	Amboin	04	38	143	34	IV
		Ambunti	04	05	144	05	V
	2304	May River (Sepik)	04	17	141	45	III-IV
	2230	Kaindi	03	30	143	34	III
	2306	Ambunti	04	14	142	49	IV
	2330	Mande (Wewak)	03	37	143	43	III-IV
	2305	Mendi	06	08	143	39	III-IV
	2303	Koroba	05	44	142	47	III
	2305	Lake Kopiago	05	25	142	27	II
1009	2325	Chuave	06	08	145	08	III
1014	1113	May River	04	17	141	45	III-IV
1015	0720	Wonenara	06	50	145	55	II

Date	Time (U.T.)	Locality	Lat (°S)		Long (°E)		Inten- sity
1015	1107	Green River	03°	57'	141°	08'	III-IV
1016	1210	Londolovit	03	10	152	40	I
	13..	Rabaul	04	13	152	15	IV
	1319						IV-V
1017	0010	Kalolo	05	59	147	12	II
1018	2035	Avatip	04	10	142	55	II
	2030	Seragwandu	03	50	142	52	II-III
	2115	Londolovit	03	10	152	40	II-III
1020	0029	Kerowagi	05	54	144	53	II
	1156	Wonenara	06	50	145	55	III
	1315	Malabunga	04	25	152	05	III
	1305	Wapot					III
	1317	Rabaul	04	13	152	15	II
1022	0346	Chevasing	06	38	146	34	III
		Wantoat	06	07	146	28	II
	0345	Pindiu	06	25	147	34	II
	0130	Tigidu	06	42	147	35	IV
	2117	Iaun	05	40	155	06	II
	2115	Buin	06	50	155	45	II
1025	0025	Keu (via Chuave)	06	19	146	04	II
		Saidor	05	38	146	28	I
		Sangan (cia Kaiap it)	06	35	146	22	IV
	0026	Pindiu	06	25	147	34	III
	0027	Lae	06	44	147	01	III-IV, IV
	0027	Mumeng	06	58	146	35	IV
		Wau	07	19	146	43	II-III
		Bulolo	07	12	146	39	III
		Babwump	06	54	146	42	IV-V
		Gabari	06	38	146	58	III
	0028	Chuave	06	08	145	08	III
		Aseki	07	22	146	11	III
		Kaintiba	07	21	146	02	II-III
		Kalalo	05	59	147	12	III
		Henganofi	06	15	145	38	III
	0029	Wau	07	19	146	43	II
	0030	Kundiawa	06	02	144	58	I-II
		Arau	06	23	146	02	IV
		Obura	06	31	145	58	IV
1026	1830	Kokopo	04	22	152	17	III-IV
		Malabunga	04	25	152	05	III
		Mioko Is.	04	15	152	29	IV
		Londolovit	03	10	152	40	II-III
	1829	Rabaul	04	13	152	15	III-IV
1027	1109	Rabaul	04	13	152	15	III
1029	0710	Konga	06	41	155	44	III-IV
1105	1050	Londolovit	03	10	152	40	II
	2233	Malabunga	04	25	152	05	III
	2235	Kokopo	04	22	152	17	II
		Mioko Is.	04	15	152	29	IV

Date	Time (U.T.)	Locality	Lat (°S)		Long (°E)		Intensity
1105	2240	Londolovit	03	10	152	40	II
		Tavui	04	10	152	11	III-IV
1106	0115	Malabunga	04	25	152	05	II
	0130	Londolovit	03	10	152	40	II
	0942	Punano	06	05	145	53	II
1112	05..	Kalalo	05	59	147	12	II-III
1113	2339	Kalalo	05	59	147	12	III
1114	1951	Rabaul	04	13	152	15	I
1115	2008	Imonda	03	20	141	08	III
	2020	Pagei	03	02	141	10	II
1117	0000	Rabaul	04	13	152	15	II
1118	1442	Arau	06	23	146	02	II
1125	2055	Woitape	08	33	147	16	II
	2057	Kokoda	08	53	147	45	II
1128	03..	Kokopo	04	22	152	17	II
	0304	Rabaul	04	13	152	15	II
	0305	Malabunga	04	25	152	05	III
	0310	Pomio	05	32	151	31	II
1130	2210	Rabaul	04	13	152	15	III
		Upper Warangoi	04	38	152	06	IV
1200	2205	Kokopo	04	22	152	17	II
	2210	Kokopo	04	22	152	17	II
		Malabunga	04	25	152	05	III
1204	1130	Rabaul	04	13	152	15	III-IV
1207	1730	Keu (via Chuave)	06	19	146	04	II
1209	15..	Kreer	03	32	143	32	III
		Mande	03	37	143	43	III
1210	0152	Kalalo	05	59	147	12	III
	0230	Aitape	03	07	142	20	III
1213	2045	Buangs (Mumeng)	06	58	146	35	III
	1430	Mande	03	37	143	43	II
1214	2030	Mumeng	07	00	146	35	III
	2100	Kaup	03	47	143	59	VI
	21..	Arau	06	23	146	02	IV-V
		Kundiawa	06	01	144	58	V
		Bairap	03	44	142	18	IV
	2103	Lake Kopiago	05	17	142	33	III
	2107	Ialibu	06	19	144	02	III-IV
		Wabag	05	28	143	43	IV-V
		Amanab	03	33	141	14	III
		Angoram	04	04	144	06	IV-V
		Chuave	06	08	145	08	IV
	2108	Pagei	03	02	141	10	III-IV
		Nanu River Wosera	03	46	142	48	IV-V
	2109	Madang	05	14	145	50	IV
		Simbai	05	17	144	33	V
		Dreikikir	03	34	142	48	V
		Kamba	05	09	145	43	V
		Miliom Lumi	03	29	142	02	IV
		Korogo	04	05	143	09	V
		Mendi	06	08	143	39	V

Date	Time (U.T.)	Locality	Lat (°S)		Long (°E)		Intensity
1214	2110	Koroba	05°	44'	142°	47'	V-VI
		Mande	03	37	143	43	V
		Porgera	05	26	142	56	IV
		Mogol	06	03	143	56	IV-V
		Manam Island	04	38	146	28	III
		Wewak	03	33	143	41	V-VI
		Kaintantu	06	18	145	52	IV
		Tambul	05	57	143	57	V
		Baiupwine	03	28	142	57	IV
		Goroka	06	05	145	25	II-III
		Minj	05	55	144	41	V-VI
		Saidor	05	38	146	28	III
		May River	04	17	141	45	IV-V
		Wonenara	06	50	145	55	I
		Kainde	03	30	143	34	IV-V
		Tari	05	52	142	57	III-IV
		Bogia	04	16	144	59	IV-V
		Kreer	03	32	143	32	V
		Ambunti	04	14	142	49	V
	2112	Punano	06	05	145	53	IV
	2115	Kompain	05	23	143	55	V
		Avatip	04	10	142	55	III
		Kalalo	05	59	147	12	IV
		Telefomin	05	09	141	37	IV
		Aiome	05	07	144	43	V-VI
	2128	Kalolo	05	59	147	12	IV
	2130	Muabu	07	23	144	40	III
		Tigidu	06	42	147	35	II
	2110	Angoram	04	05	144	05	IV
		Dreikikir	03	34	142	47	IV
		Manam Island	04	05	145	05	III
	2205	Yemas Village (Amboin)	04	38	143	34	V
	2208	Karimui	06	25	144	50	II
1215	1415	Turuk	06	20	149	38	IV
	1416	Kalalo	05	59	147	12	II-III
	1510	Kainantu	06	18	145	52	III
1216	1100	Buangs (Mumeng)	06	58	146	35	II
	0930	Aseki	07	22	146	11	II
	1430	Aseki	07	22	146	11	II
	2109	Erave	06	38	143	52	II
1219	0020	Amboin	04	38	143	34	V
	0030	Ambunti	04	14	142	49	III
1222	13..	Sepsep	06	06	149	29	IV
1223	13..	Obura	06	31	145	58	II
	....	Kaiapit	06	17	146	15	II
	1515	Salamo	09	40	150	50	III
	1550	Salamaua	07	03	147	04	V
	16..	Guari	08	02	146	57	IV
	13..	Popondetta (Isivini)	08	47	148	15	IV

Date	Time (U.T.)	Locality	Lat (°S)		Long (°E)		Intensity
1223	13..	Talasea	05°	17'	150°	04'	0
	1550	Saidor	05	38	146	30	III
		Morobe	07	45	147	37	IV-V
	14..	Goroka	06	03	145	25	IV
	1555	Wonenara	06	47	145	54	III-IV
		Ioma	08	21	147	50	III
	1554	Tufi	09	05	149	20	IV
		Boana	06	25	146	49	III
	1550	Garaina	07	54	147	10	III
	1541	Wau	07	19	146	43	IV
	1552	Popondetta	08	47	148	15	V
		Lalaura (Marshall Lagoon)					IV-V
	1551	Cape Gloucester	05	25	148	25	III
	17..	Kelanoa	06	01	147	32	IV
	1545	Kumbun	06	05	149	04	IV
	1550	Buhia					V
	1551	Mumeng	06	58	146	35	V
	1552	Chuave	06	08	145	08	V
	1555	Kabwum	06	12	147	12	V-VI
	1550	Pindiu	06	25	147	34	VI
	1650	Lae	06	44	147	01	V
	1552	Popondetta	08	47	148	15	V
	1555	Aseki	07	22	146	11	V
		Port Moresby	09	30	147	08	IV-V
	1552	Kokoda	08	53	147	45	V
	1600	Apugi (v.Kandrian)	06	23	149	32	V
	1552	Kwikila	09	50	147	41	V-VI
	1550	Sag Sag	05	35	148	19	V
	1555	Turuk	06	20	149	38	V
	14..	Aisega	05	44	148	22	V
	1555	Kainantu	06	18	145	52	V
	1600	Saidor	05	38	146	28	III
		Karimui	06	25	144	50	I-II
	1602	Salamo	09	40	150	50	IV
1224	1900	Erave	06	38	143	52	I
1225	1555	Goroka	06	05	145	25	II
	1551	Mumeng	07	00	146	35	V-VI
1226	0100	Kelanoa	06	01	147	32	III
1227	0550	Mendi	06	08	143	39	III
	0520	Kainantu	06	18	145	52	IV
	0540	Kamba	05	09	145	43	III
	0540	Goroka	06	05	145	25	II-III
	0542	Bundi	05	45	145	15	V

TABLE 4

Seismograph Station Description

Place	Code	Lat. (S)			Long. (E)			Elevation (metres)	Lithological foundation	Remarks
Agenhambo	AGE	08°	48'	49"	148°	05'	56"	303	Unconsolidated volcanic ash	Commenced November
Daru	DNG	09	05	19	143	12	20	03	Unconsolidated clays	LP - Feb.-Sept. SP - Sept.-Oct. Ceased October
Esa'Ala	ESA	09	44	18	150	48	41	46	Granite Gneiss	
Keravat	KRT	04	21	10	152	03	06	20	Coastal Alluvium	Not operational
Kerema	KRG	07	57	35	145	46	08	14	Clay	LP Jan-Sept. SP Oct. LP Nov-Dec.
Lae	LAE	06	40	23	146	54	48	100	Unconsolidated alluvium	Commenced November
Port Moresby	PMG	09	24	33	147	09	14	67	Eocene chert	
Rabaul	RAB	04	11	29	152	10	11	184	Basalt flow	
Sulphur Creek	SUL	04	13	10	152	10	33.3	08	Unconsolidated volcanic ash	Not operational
Tabele	TBL	04	06	05	145	00	41	180	Basalt flow	Commenced Nov.
Tapini	TPN	08	21	25	146	59	01	989	Clay	LP - Jan-Sept. SP - Sept.-Dec. Ceased December

LP = Long period system SP = Short period system

TABLE 5

Seismograph Station Instrumentation

Station	Seismometer Type	Seismometer Comp	Seismometer To	Recorder Type	Recorder Speed	Recorder Tg	System magnification	Gain	Remarks
AGE	Wil	Z	0.6	Wil	60	0.2	1000	1/10	Underdamped
DNG	P/E	Z	15	ER230	60	LP(~100)	800		Feb-Sept.
	W/L	Z	1.1	"	"	SP(~1)	5000		Sept-Oct. Ceased October
ESA	Ben	Z	1.0	Film	15	0.2	30,000	50%	Critically damped
	Ben	N,E	1.0	(1301-A)	15	0.2	18,000		Critically damped
	Ben	N,E	1.0	Paper (1656-D)	30	60	unknown		Critically damped
KRT	BMC	Z	1.2	Film	15	0.35	unknown	20%	Critically damped
		N	1.4		15	0.26	unknown	10%	Critically damped
		E	1.4		15	0.29	unknown	10%	Critically damped
KRG	P/E	Z	15	ER230	60	LP(~100)	800		Jan-Sept, Nov-Dec.
	Wil	Z	1.0	"	"	SP (~1)	5000		Oct.
LAE	P/E	Z	15	ER230	60	LP (~100)	800		
PMG		Z,N,E		World Standard		SP	50,000		
		Z,N,E		World Standard		LP	3000		
	SPH	N	15	Sprengnether	30	15	700		Over damped
		E	15	Sprengnether	30	15	700		Over damped
	W/A	N	0.8	Sprengnether	30	-	2200		

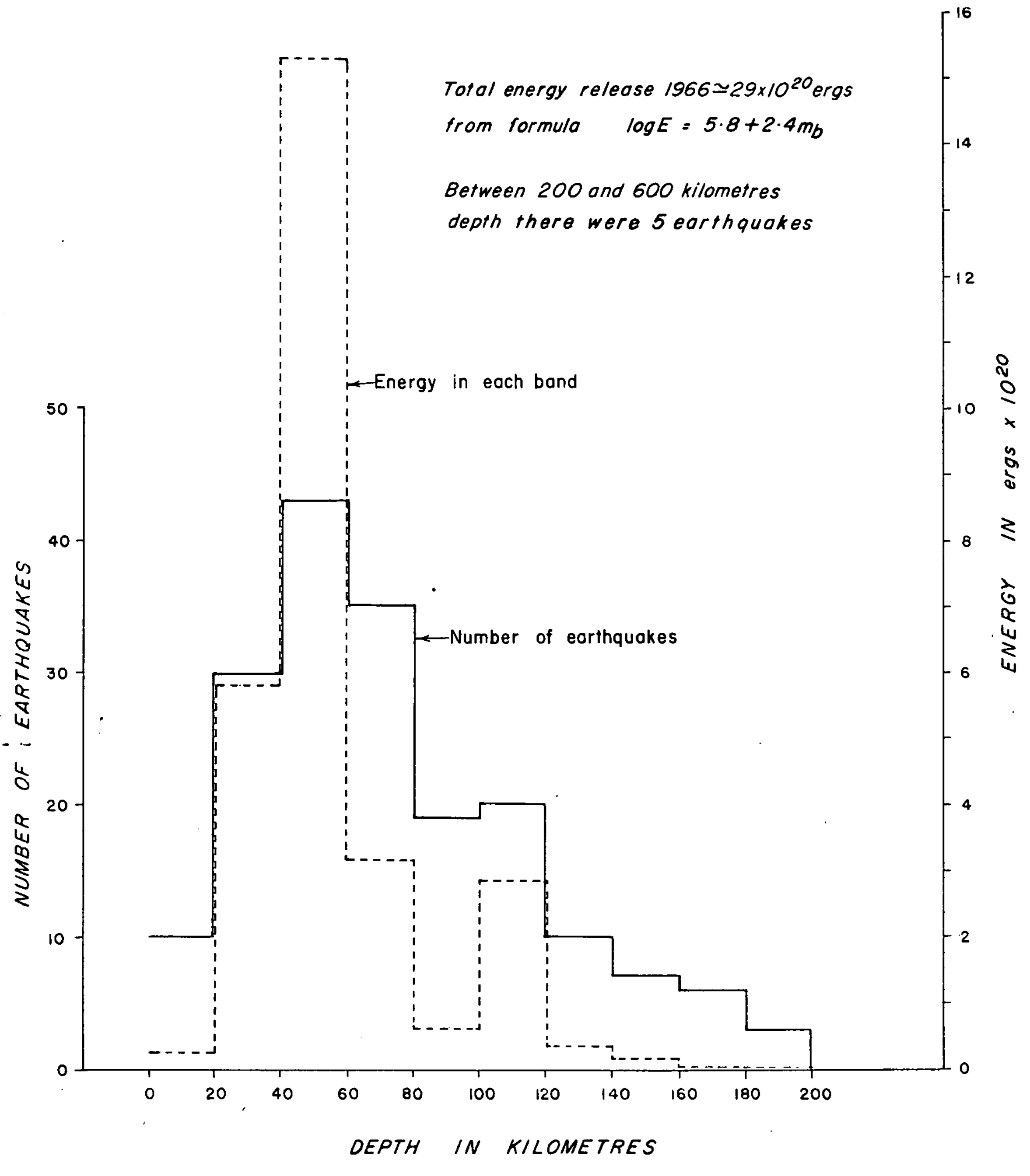
Station	Seismometer			Recorder			System	Gain	Remarks
	Type	Comp	To	Type	Speed	Tg	magnification		
PMG	W/A	E	0.8	Sprengnether	30	-	1,600		
	DTM		4	"	30	1.7	11,000		
			4	"	30	15	700		
RAB	Z	Z	World Standard			SP	12,500		
		N,E	World Standard			SP	6,250		
		Z,N,E	World Standard			LP	750		
	Ben P	Z	1.0	Hel	60	0.02	3,240		
	OMO	N	3.6				12		
		E	3.8				10		
SUL	Ben P	Z	1.0	Hel	60	0.02	3,240		Signal telemetred to recorder at RAB
TBL	Ben	Z	1.0	Wil	60	0.2	1,350		Critically damped
TPN	P/E	Z	15	ER230	60	100	800		Jan-Sept.
	Wil	Z	1	"	"	1	10,000		Sept-Dec. Ceased December

Wil = Willmore; P/E = Press Ewing; W/L = Wilson Lamison; Ben = Benioff standard; BMC = Benioff moving coil; SPH = Sprengnether Type H; W/A = Wood-Anderson; DTM = Department of Terrestrial Magnetism, Washington; Ben P = Benioff portable; OMO = Omori; Hel = Helicorder Model 2484; ER230 = UED Pen Recorder.

PLATE I

(Based on G20-35)

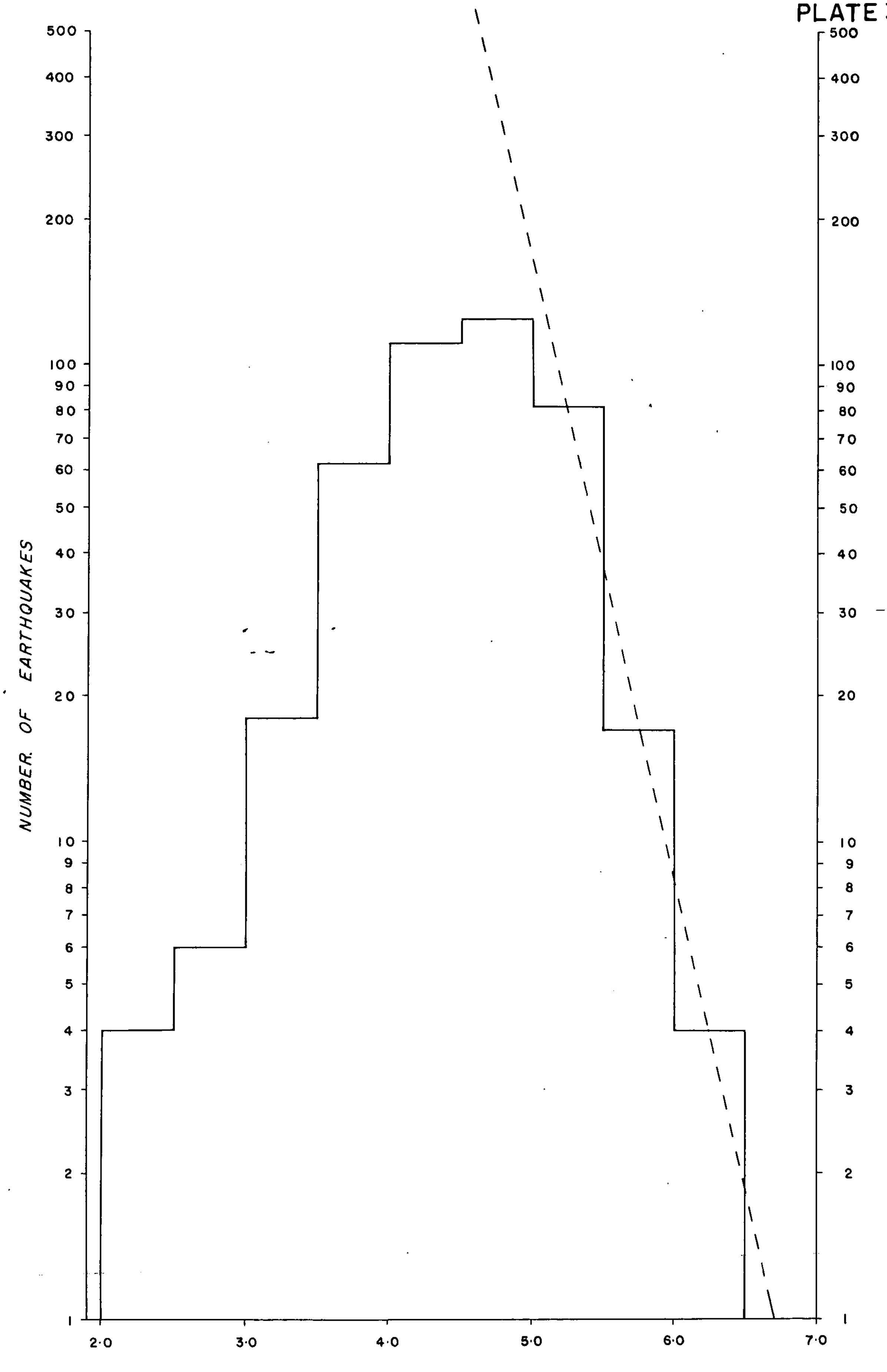
PLATE 2



DEPTH DISTRIBUTION OF PAPUA AND NEW GUINEA EARTHQUAKES 1966

TO ACCOMPANY RECORD No 1968/87 G82/4-66

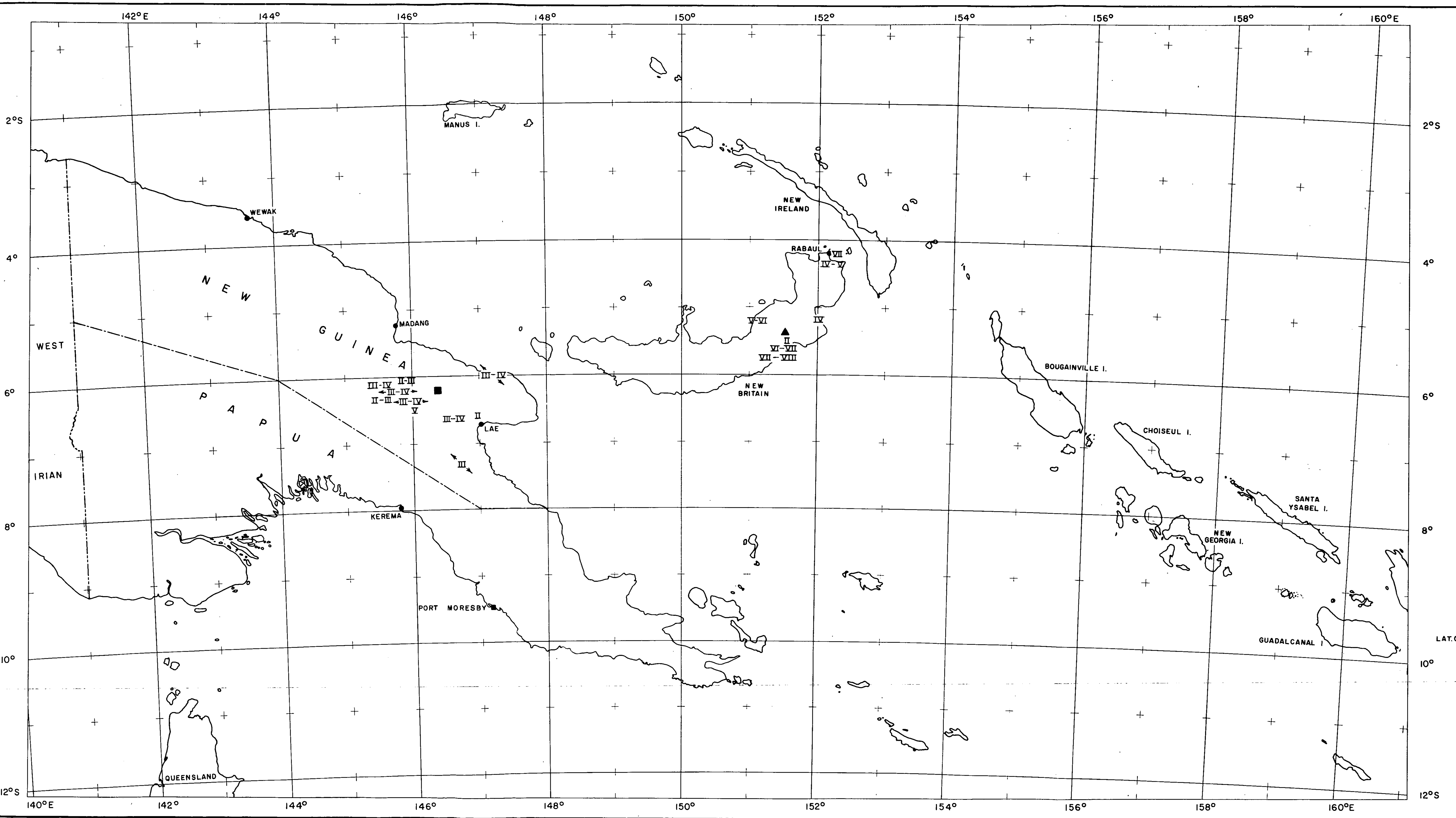
PLATE 3



MAGNITUDE DISTRIBUTION OF PAPUA & NEW GUINEA EARTHQUAKES 1966

TO ACCOMPANY RECORD No 1968/87 G82/4-67

PLATE 4



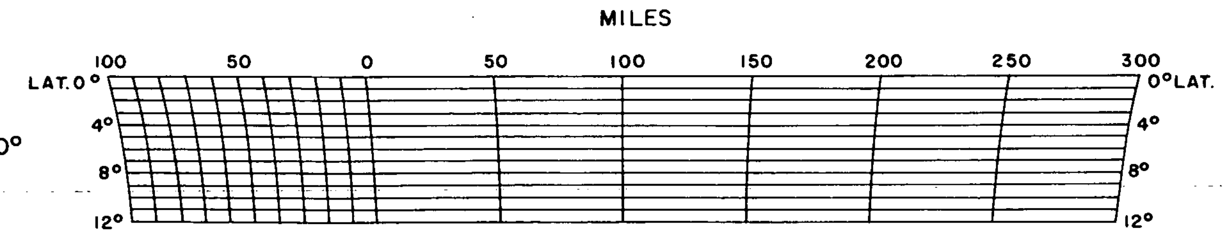
(Based on G20-49)

MODIFIED MERCALLI INTENSITIES FROM EARTHQUAKES OF 22 FEBRUARY AND 6 OCTOBER 1966

LEGEND

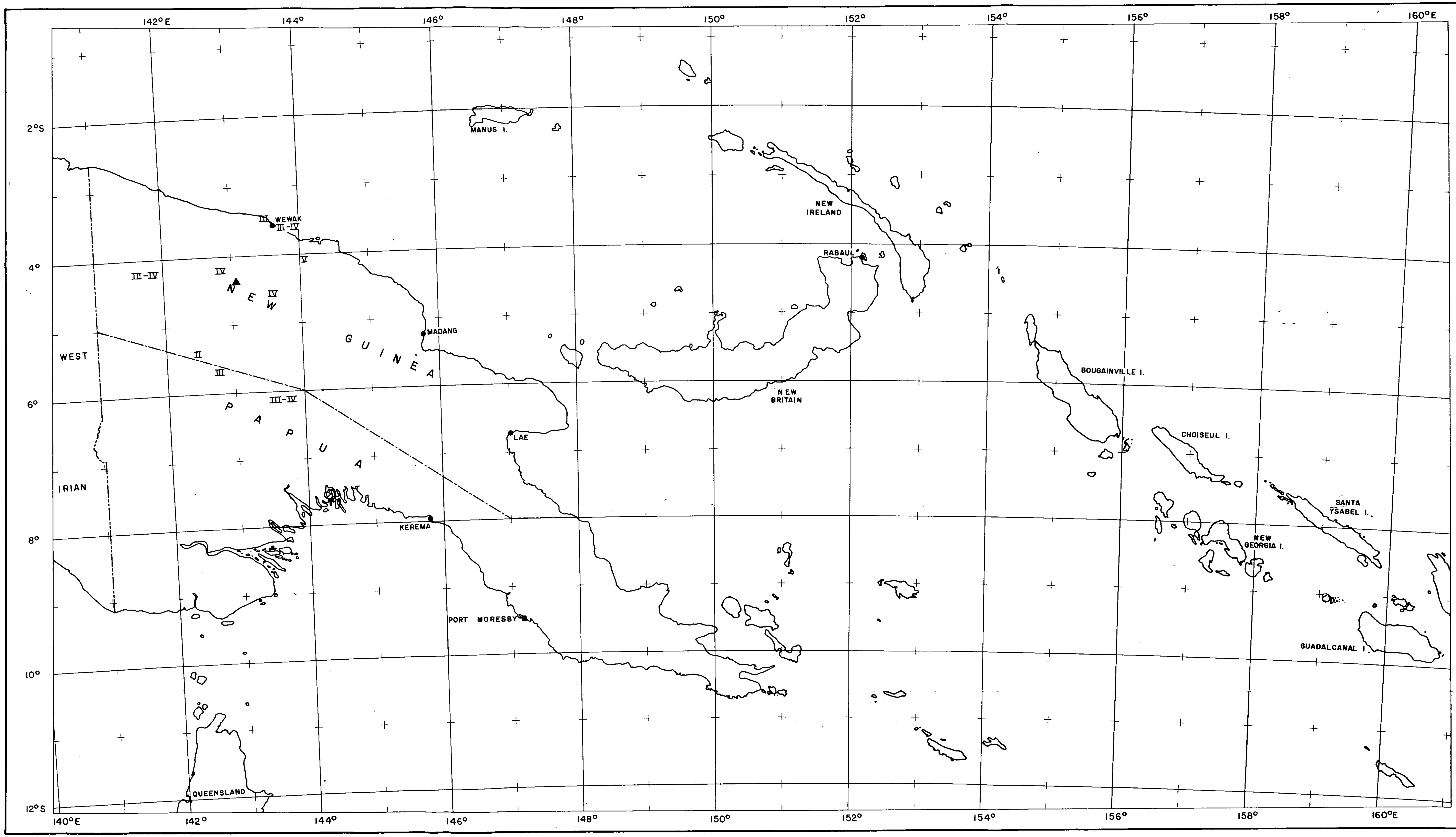
22 February, 1966 ▲
- Epicentre 5·4 S, 151·5 E
- Depth 28 kilometres
- Magnitude 6·2

6 October, 1966 ■
- Epicentre 6·2 S, 146·4 E
- Depth 113 kilometres
- Magnitude 5·5



TO ACCOMPANY RECORD No 1968/87

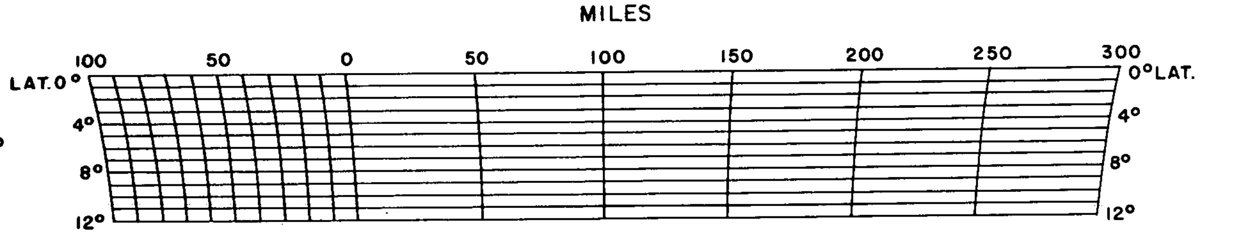
G82/4-68



MODIFIED MERCALLI INTENSITIES FROM EARTHQUAKE OF 7 OCTOBER 1966

LEGEND

7 October, 1966 ▲ Epicentre 4·4 S, 143·1 E; Depth 95 kilometres; Magnitude 5·3

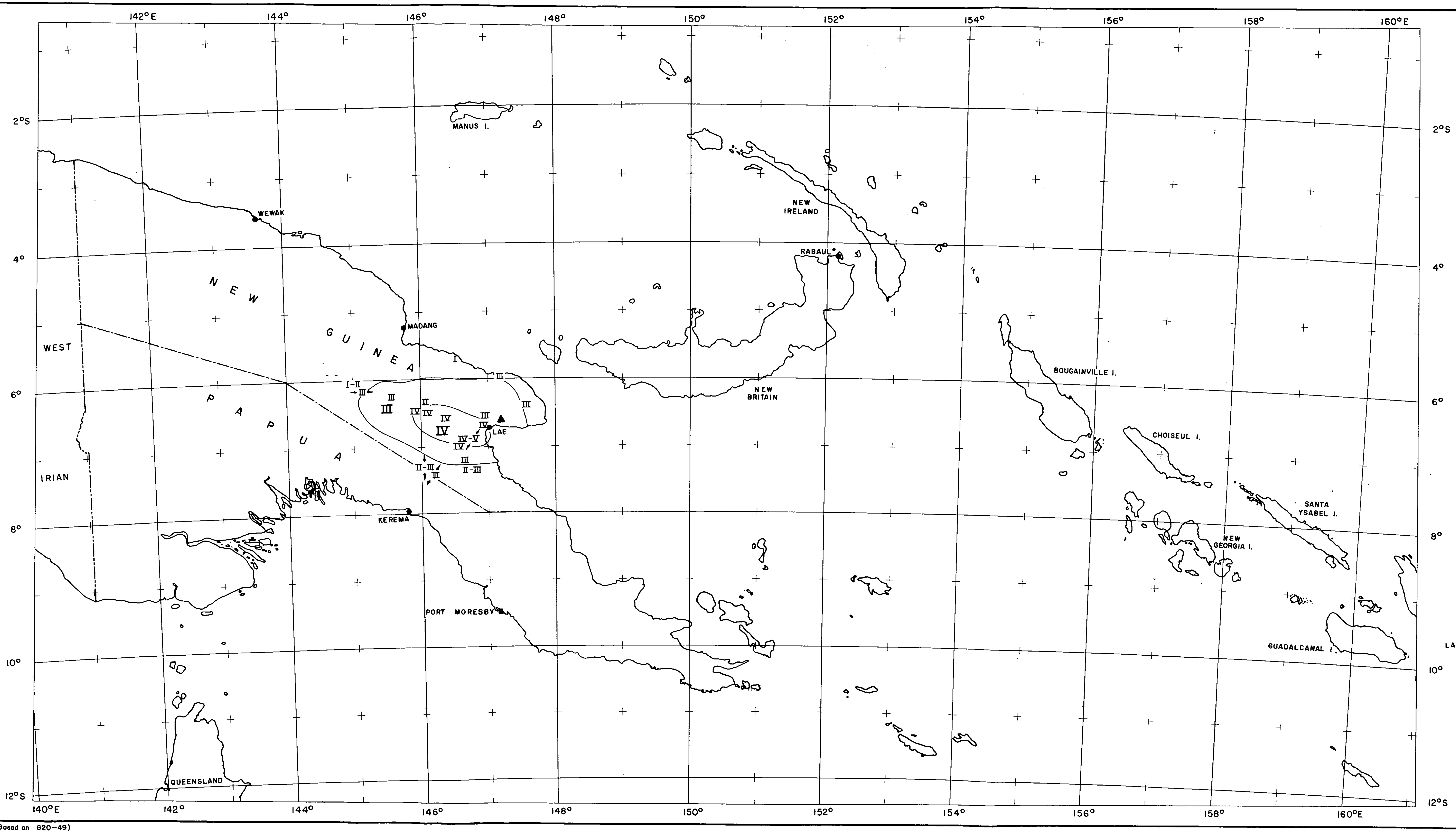


TO ACCOMPANY RECORD No 1968/87

G82/4-69

(Based on G20-49)

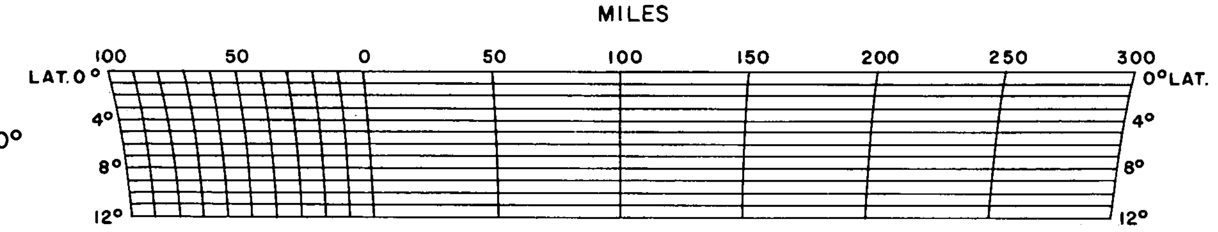
PLATE 6



MODIFIED MERCALLI INTENSITIES FROM EARTHQUAKE OF 25 OCTOBER 1966

LEGEND

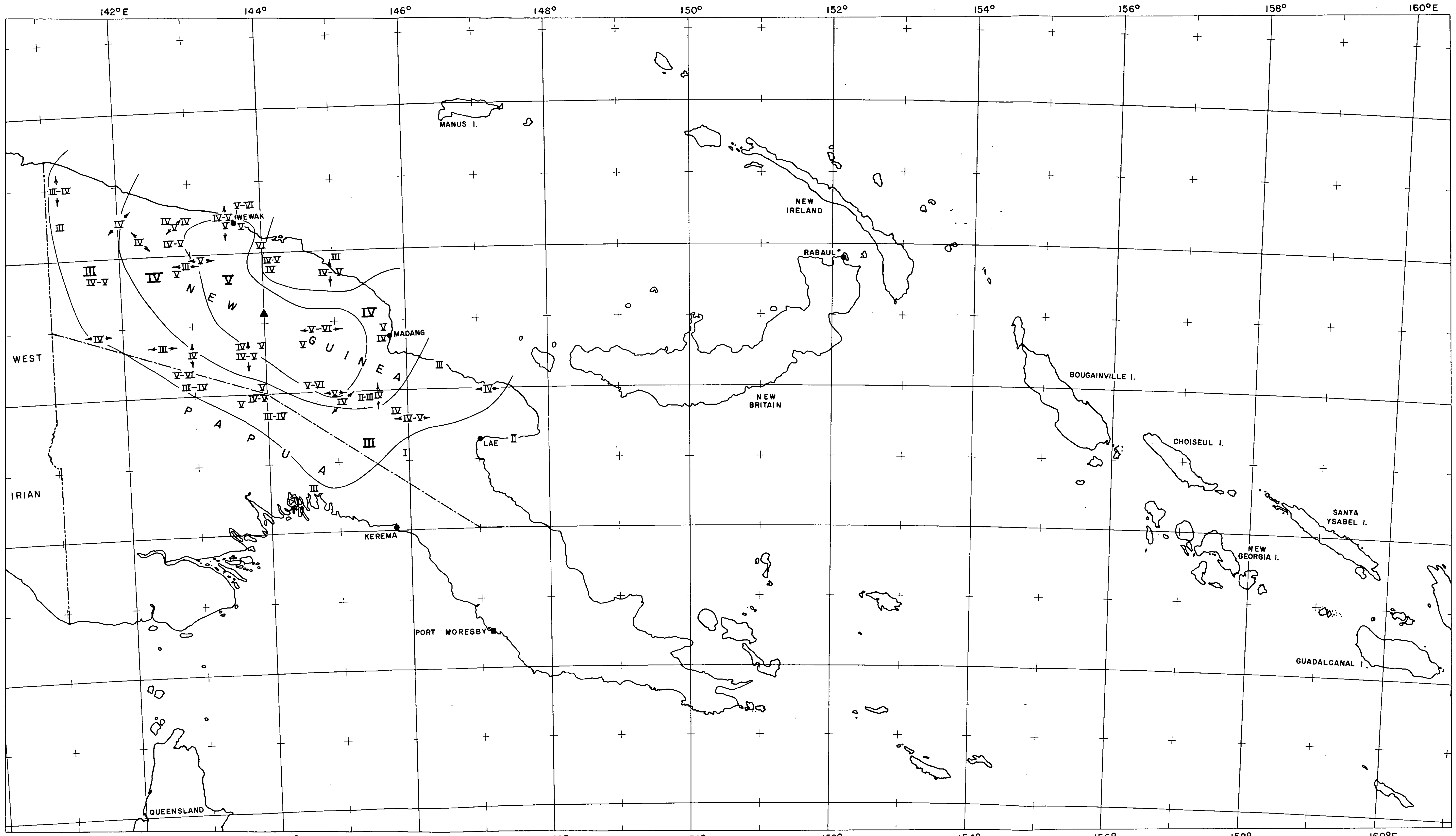
25 October, 1966 ▲ Epicentre 6·6 S, 147·2 E; Depth 67 kilometres; Magnitude 5·3



(Based on G20-49)

TO ACCOMPANY RECORD No 1968/87

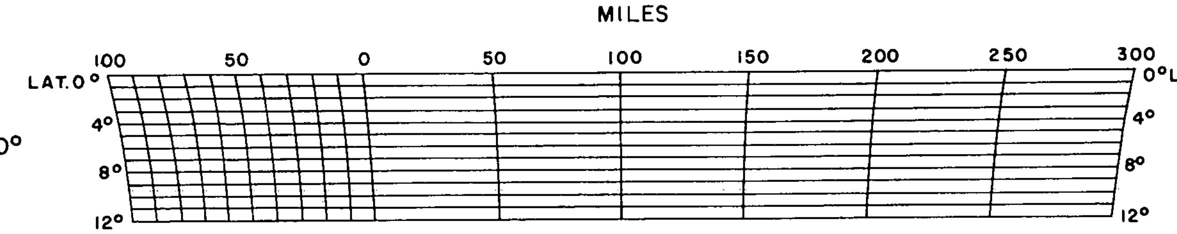
G82/4-70



MODIFIED MERCALLI INTENSITIES FROM EARTHQUAKE OF 14 DECEMBER 1966

LEGEND

14 December, 1966 ▲ Epicentre 4·9 S, 144·0E; Depth 68 kilometres; Magnitude 6·0

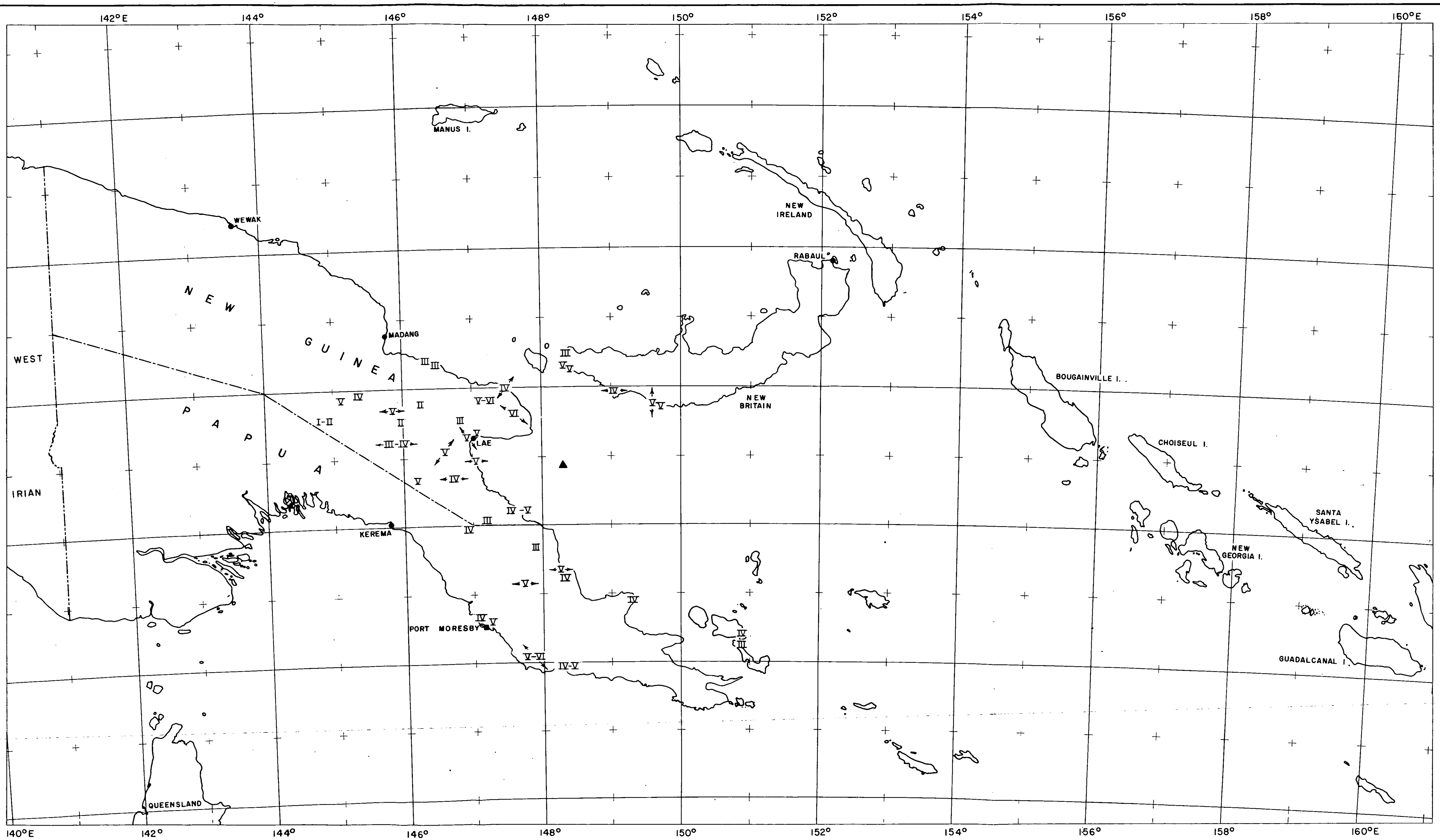


TO ACCOMPANY RECORD No 1968/87

G82/4-71

(Based on G20-49)

MODIFIED MERCALLI INTENSITIES FROM EARTHQUAKE OF 23 DECEMBER 1966



LEGEND

23 December, 1966 ▲ Epicentre 7·1 S , 148·3 E; Depth 53 kilometres; Magnitude 6·4

MILES

100 50 0 50 100 150 200 250 300

LAT. 0° 4° 8° 12°

BINDING MARGIN 1/2"

Telephone : 4458

Telegrams :
"Buromin" Port Moresby.

Postal Address :
P.O. Box 323, Port Moresby.

COMMONWEALTH OF AUSTRALIA

DEPARTMENT OF NATIONAL DEVELOPMENT
BUREAU OF MINERAL RESOURCES, GEOLOGY & GEOPHYSICS

Port Moresby Geophysical Observatory,
Port Moresby, Papua,

We would be grateful if you would complete the questionnaire form below whenever you feel an earthquake. The results will assist studies being made into the risk of damage to constructions by earthquakes and the general nature of earthquake activity in the Territory. Wherever possible answer simply by underlining the words which are applicable or by adding more suitable words in the blank spaces. Any additional information will be appreciated. If necessary enclose an additional sheet.

Please refold this sheet and return in the envelope provided. Your co-operation would be appreciated.

Dr. D. Denham,
Observer-in-Charge

QUESTIONNAIRE

Name (block letters)..........

Address..........

District..........

Date of shock..........Time..........A.M..........P.M..........

Place where you were at time of shock..........

Motion rapid, slow..........Shook how long..........

Felt by me, several people, many, all..........

Direction of motion felt outdoors ; not certain, N., NE., E., etc.

....

Nature of ground underneath locality ; rock, soil, loose, compact,

marshy, filled in..........

level, sloping, steep..........

Awakened me, no one, few, many, all (in my home)..........

(in community)..........

Frightened me, no one, few, many, all (in my home)..........

(in community)..........

Rattling of windows, doors, dishes..........

Creaking of walls, frame..........

Hanging objects, doors, etc., did, did not, swing, N., NE., etc.

....

Trees, bushes shaken slightly, moderately, strongly, fell down

....

Shifted small objects, furnishings..........

Overturned small objects, furniture..........

Cracked plaster, windows, walls, ground..........

Fall of, books, pictures, plaster, walls..........

Broke dishes, windows, furniture..........

Twisting, fall of columns, monuments, water tanks..........

....

Damage : none, slight, considerable, great, total, in building built

of Native Materials wood, brick, masonry, concrete..........

Pets : did the dog, cat get frightened? Yes. No. Did not notice

....

Animals : what did the animals do?..........

Noise : I did, did not hear anything..........

It sounded like a truck like thunder, like rolling a galvanized

iron tank..........

The sound seemed to come from over the hill, across the

flat, in the air, below my feet..........

from the N.S.E.W..........

The sound lasted for..........seconds.

Ground : Did people fall over, just stand, just walk, have no

trouble..........

were there landslides, water waves, ground waves, nothing

....

REMARKS.

Signature..........

Govt Print.—A2054/5.67.—1,000.

EARTHQUAKE QUESTIONNAIRE

TO ACCOMPANY RECORD No 1968/87 G82/4-54

PLATE 9