

15th QUAR 1937

Bulletin E 58 1937 JAN

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

Tables used :—

(1) For normal earthquakes—

(a) Tables, by H. Jeffreys and K. E. Bullen, 1935.

(b) Pasadena Travel-time Curves, by B. Gutenberg and C. F. Richter, 1934.

(2) For deep earthquakes—

(a) Depth, Time, and Distance Chart, by G. J. Brunner.

(b) Tables by K. Wadati and K. Masuda.

Determination of focal depth is made by means of the Brunner Chart; and by the methods due to K. Wadati (Bull. Eq. Inst., vol. 9, p. 494, 1933) and to R. C. Hayes (Dominion Observatory Bulletin 107).

In these reports, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
East Cape ..	37° 40' S	178° 35' E	505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' E	212	Rhyolite tuffs ..	Powerhouse Superintendent.
Tuai ..	38° 48' S	177° 9' E	960	Gravels	Resident Electrical Engineer.
New Plymouth ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	(a) Superintendent, the Prison. (b) Mr. C. E. Morshead.
Stratford ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Mr. A. W. Burrell.
Hastings ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Mr. H. de Denne.
Bunnythorpe ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Mr. W. A. Waters.
Takaka ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	The Postmaster.
Greymouth ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels	District Engineer, P.W.D.
*Glenmuick ..	42° 54' S	173° 9' E	247	Gravels	Mr. C. J. Westland.
Christchurch ..	43° 32' S	172° 37' E	25	Gravels	Director, Magnetic Observatory.
Chatham Islands	43° 57' S	176° 31' W	210	Volcanic breccia ..	Superintendent, Radio Station.
Monowai ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Mr. W. H. Hutton.

* Privately-owned station.

[1,500/6/36—3636

WELLINGTON (DOMINION OBSERVATORY)

International
Seismological
CentreObservers. W.M. Jones.
C.N. Watson-Munro

Acting-Director: R.C. Hayes.

Instruments and Constants.

	Pend. Period =	Damping	Magnification
Milne-Shaw (N-S)	9.8 sec.	Magnetic 24:1 (1937 Jan)	250
Wood-Anderson (N-S)	" = 0.55 "	" 8:1 (1936 Dec)	-
Imamura (N-S)	" = 5 "	Oil 10:1 (1937 Jan)	2
" (E-W)	" = 5 "	" 10:1 (" ")	2
" (Z)	" = 4 "	" 1.2:1 (" ")	2
Galitzin-Wilip (Z)	" = 7.0 "	Magnetic $\mu = + 0.43$	$\frac{AK}{II} = 160$
	Galv. " = 10.6		

The constants of the Galitzin-Wilip are not reliable.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Jan. 1	i i i M	6 11 17 20 22 24			Local shock
1	P S i	9 54 14 24 27		9.9?	Felt at Dannevirke R-F 3.
2	e	23 21			Traces
3	e eL?	10 58 11 10			Slight tremors.
4	e	23 06 40 14	15		Tremors from distant shock.
5	eL M	0 10 31	16		
5	eL M	5 06 23	15		
5	P S? i i iL i M	10 27 42 29 25 30 44 31 18 47 33	6 10 10	9.2?	Felt about Foveaux Strait max. R-F 4.
6	eL M	3 11 17	18 9		
6	eL	4 13			
6	i i	5 54 02 04			Local
7	iP? i S M	4 35 02 15 25 34		2.0?	Felt at New Plymouth, R-F 3
7	PKP SKKS PPS SS Lq L	13 39 14 48 27 52 54 58 14 05 23	40 25	135±	Interpretation doubtful.

DATE 1937	PHASE	G.M.T. h. m.s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Jan. 8		15 48	15		Traces.
9	eL	3 37	15		Tremors.
9	eL	5 42	15		"
10	eL	23 29	10 -14		Tremors.
13	i M	18 47 16 20			Local
15	eL	5 45			Traces.
17	P i S	4 36 10 17 35		2.2	
17	eL	8 15			Tremors.
18	eL M	3 53 55	8		
19	P S M	22 59 46 59 23 00 00		1.1	Felt at Blenheim, R-F 3
22	eL	4 50			Tremors.
22	P? S	20 06 57 07 12		1.3?	P very indefinite
23	i i	4 50 56 51 08			Local tremors.
23	i i L M	9 54 33 55 27 57 10 00	10 9		
23	P pP i iPcS? S L M1 M2	11 03 35 52 06 10 09 42 10 15 13 03 18 21	5 8 22 20	45.3	PP or PcP
24	P? S i	16 37 22 40 44		1.6?	P very feeble.
24	P? S M	19 05 55 06 18 22		2.0?	P very feeble. Felt at Collingwood, R-F 3.
25	e	2 10			Tremors.



DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Jan. 25	P	6 40 36		30.8	
	pP?	41 03			
	PP?	45			
	pPP?	42 02			
	PcP	34	9		
	S	45 40			
	i	46 17			
	PcS?	47 04			
	Lq	49 39			
	Lr	50 30			
	M1	52	19		
	M2	57	14		
	M3	7 00	12		
	M4	02	10		
	M5	06	10		
	M6	09	10		
26	eL	7 41			Tremors.
26	e	16 47			"
26	e	20 25			"
27	eL	4 28	18		"
27	i	6 14 43			
	eL	16	17		
29	eL	13 25			
	M	27	10		
30	e	6 59			Distant tremors.
31	P	23 08 37		0.9	
	i	43			
	i	44			
	S	47			

In addition small local tremors were recorded as follows:

Jan. 10d 04h 18m; 10d 22h 02m; 18d 7h 49m; 18d 18h 18m; 21d 23h 16m;
26d 22h 41m; 27d 11h 31m.

A R A P U N I.

Milne Seismograph; E-W component, undamped, Pend. period=24 sec.
(1937 Jan.); Magnification = 5.6

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Jan. 5	eL	10 31+			
	M	33			
6	eL	3 12			



DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Jan. 7	e i SKKS? PPS? Lq? M1 M2 M3 L M	13 44.5 46.6 48.5 53.0 14 05 09 12 20 25 26			
9	e	3 38			
9	e	5 42			
22		4 46			Tremors.
23	eL	9 56.8			
23	iS? L M	11 09.5 13.3 17			
25	P S L M	6 40.8 45.5 47.0 48		27.7	

NEW PLYMOUTH.

Wood-Anderson Short-period Seismograph, E-W component.

Pend. period = 0.78 sec.

Magnetic damping 10.1 (1937 Jan.)

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Jan. 7	iP	11 20 50			Local tremor.
7	eL M	14 23 28	27		Distant shock.
7	iP	14 33 31			Small local tremor.
7		16 22 20			" " "
7	iP	20 21 24			Local tremor.
7		22 44 09			Small local tremor.
24		6 40			Distant shock.
26	P S	22 37(00) 18		1.6	
27	P? S	1 43(00) 05		0.45?	P very uncertain.
27		5 16			Local tremor.

H A S T I N G S .

Milne-Jaggard Seismograph; NE-SW component.

Local tremors were recorded as follows:

Jan. 6d 14h 34m; 11d 23h 21m; 12d 06h 53m; 12d 19h 51m;
15d 02h 43m.

T A K A K A .

Milns-Jaggard Seismograph, E-W component.

A small local shock was recorded on January 19d 23h 0m.

CHRISTCHURCH (MAGNETIC OBSERVATORY)

(Earthquakes within about 10° only, as recorded on Wood-Anderson Seismograph. For more distant earthquakes, see special report of the Magnetic Observatory on 8 th page.)

Wood-Anderson Short-period Seismograph; E-W component, magnetic damping, Pend. period = 0.8 sec., damping = 0.85.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Jan. 1	S? i i	6 13 24 27 32			
5	P S	10 27 34 28 48		6.5	From Magnetic Observatory Provisional Report.
9	P S i	5 37 46 39 06 34		7.1	
17	P? S	4 36 16 45		2.5?	P very indefinite.
19	P? S	22 59 56 23 00 27		2.7?	
22	P S	20 06 44 58		1.2	
22		21 03			Local tremor.
31	i	23 09 28			Local shock.

M O N O W A I.

Milne-Jagggar Seismograph, E-W component.

Local tremors were recorded as follows: Jan. 5d 10h 27m, 14d 09h 46m.

N O T E S

(1937 January)

No earthquakes were recorded during the month at TUAI, STRATFORD, BUNNYTHORPE, GREYMOUTH, CHATHAM ISLANDS.

The records of the New Plymouth seismograph have been interrupted occasionally on account of clock trouble.

A new station has been established at Kaitaia (Lat. 35° 7' S. Long. 173° 21' E) with the Milne-Shaw seismograph, No. 36, which was transferred from Wellington during the month.

The following information should be added to the previous report, Bulletin E 57, 1936 December, page 5, ROTORUA:

"Lat. 38° 8' S., Long. 176° 15' E. Height above M.S.L. = 930 ft." Milne-Jagggar seismograph; "E-W component."

PROVISIONAL EPICENTRES IN NEW ZEALAND AND
SOUTH-WEST PACIFIC, 1936 DECEMBER.

Origin Time (G.M.T.) 1936 d h m	Provisional Epicentre		Focal Depth	Remarks.
	Lat. (deg)	Long. (deg)		
Dec. 4 22 26	26 S	168 E	Normal	Epicentre from Riverview, Christchurch, Wellington.
11 20 08	40.7 S	172.4 E	Normal	Felt in South Island, N.Z. R-F ₆
26 22 53	30 S	180	Normal	Epicentre from Manila, Adelaide, Riverview, Christchurch, Wellington, Apia.
29 14 47	5 S	153 E	Deep (Christchurch)	Epicentre from Manila, Riverview, Adelaide, Christchurch, Wellington, Apia.

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological reports, received during the month of January, 1937.

Manila December, 1936 (Preliminary)
 Tokyo January - June, 1936. Part 1 and 2.
 Nanking. July - September, 1936.
 Saint Louis. June 1936.
 Central Station of the Jesuit Seismological Association, Oct. 1936
 Perth October, 1936. (Preliminary)
 Riverview December, 1936.
 Adelaide December, 1936 (Preliminary)
 Perth September, October, 1936.
 Kew November, 1936.
 Ottawa November, 1936.
 Chiufeng November, 1936.
 Ksara November, 1936.

Phu-Lien . . . . .	.September, 1936, August, 1936.
Union Geodesique et Geophysique Internationale.	November, 1936.
Bureau Central Seismologique Francais.	November, 1936
Universite de Strasbourg	.November, 1936.
Parc Saint-Maur . . . . .	.November, 1936.
Rathfannham Castle . . . . .	.October, November, 1936.
Sydney . . . . .	.December, 1936.
Barcelona. . . . .	.August - December, 1935. January - March 1936.
Schweizerisches Erbebenbulletin, No 78,	November.
Apia . . . . .	.October - December, 1936.
Hong Kong. . . . .	.November, 1936. December, 1936 (Preliminary)
Manila . . . . .	.November, 1936. December, 1936 (Preliminary)
La Plata . . . . .	.November, 1936
La Paz . . . . .	.January - May 1936.



MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN, JANUARY, 1937.
(Prepared by the Director, Magnetic Observatory.)

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES, REMARKS.
Jan. 3d.	P S Lr	11.01.50 6.40 9.42	28°0
4d.	P S LqE Lr	22.55.42 02.50 06.55 10.39	49°0
5d.	P S Lq Lr	00.03.59 11.30 16.36 20.04	52°5
5d.	PZ SNE	04.55.42 05.03.02	50°6
5d.	P S	10.27.34 28.48	6.°5
7d.		6.51.0 ca,	slight seismic activity.
7d.	ePZ SKS SKKS Lq Lr M	13.37.47 48.19 49.10 14.05.58 13.54 21.40	102 ^t Largest on N.
8d.		15.46 ca.	slight seismic activity.
9d.		3.34.19	slight seismic activity.began.
9d.	eN e	5.37.39 39.27	Small, from near shock. larger movement.
10d.		23.27 ca	slight seismic activity.
15d.		5.34 ca	slight seismic activity.
17d.		8.06 ca	" " "
18d.		3.52 ca	" " "



DATE	PHASE	G.M.T.	DISTANCE IN DEGREES, REMARKS.
Jan. 22d.		4.52 ca	Slight seismic activity.
23d.	S? Lq Lr	9.53.14 54.50 56.14.	in microseisms.
23d.	iP iS	11.03.29 09.47	41°0 Surface waves comparatively small.
25d.		2.09 ca	Slight seismic activity from this time.
25d.	iP iS Lq Lr	6.40.50 46.14 48.20 50.20	32°7 compression.
25d		18.56 ca	slight seismic activity.
26d.		6.34 ca	" "
26d.		15.39 ca	" " "
26d.	Lq Lr	20.24.00 26.04	
27d.		4.31 ca	slight seismic activity.
27d.		6.15 ca	" " "
29d.		0.05 ca	" " "
29d.		4.34 ca	" " "
29d.	S?N LqE Lr	13.22.12 23.45 25.10	in strong microseisms.
29d.		17.59 ca	slight seismic activity.
30d.		5.58 ca	" " "
30d.		6.50 ca	" " "

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

Tables used :—

(1) For normal earthquakes—

(a) Tables, by H. Jeffreys and K. E. Bullen, 1935.

(b) Pasadena Travel-time Curves, by B. Gutenberg and C. F. Richter, 1934.

(2) For deep earthquakes—

(a) Depth, Time, and Distance Chart, by G. J. Brunner.

(b) Tables by K. Wadati and K. Masuda.

Determination of focal depth is made by means of the Brunner Chart ; and by the methods due to K. Wadati (Bull.Eq.Inst., vol. 9, p. 494, 1933) and to R. C. Hayes (Dominion Observatory Bulletin 107).

In these reports, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
East Cape ..	37° 40' S	178° 35' E	505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' E	212	Rhyolite tuffs ..	Powerhouse Superintendent.
Tuai ..	38° 48' S	177° 9' E	960	Gravels	Resident Electrical Engineer.
New Plymouth ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	(a) Superintendent, the Prison. (b) Mr. C. E. Morshead.
Stratford ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Mr. A. W. Burrell.
Hastings ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Mr. H. de Denne.
Bunnythorpe ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Mr. W. A. Waters.
Takaka ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	The Postmaster.
Greymouth ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels	District Engineer, P.W.D.
*Glenmuick ..	42° 54' S	173° 9' E	247	Gravels	Mr. C. J. Westland.
Christchurch ..	43° 32' S	172° 37' E	25	Gravels	Director, Magnetic Observatory.
Chatham Islands	43° 57' S	176° 31' W	210	Volcanic breccia ..	Superintendent, Radio Station.
Monowai ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Mr. W. H. Hutton.

* Privately-owned station.

WELLINGTON (DOMINION OBSERVATORY)

Observer: W.M.Jones

Acting-Director: R.C.Hayes.

Instruments and Constants:

	Pend. Period	Damping	Magnification
Milne-Shaw (N-S)	10.2 sec.	Magnetic 23:1 (1937 Feb.)	250
Wood-Anderson (N-S)	0.55 "	" 8:1 (1936 Dec.)	-
Imamura (N-S)	5 "	Oil 10:1 (1937 Jan.)	2
" (E-W)	5 "	" 10:1 (" ")	2
" (Z)	4 "	" 1.2:1 (" ")	2
Galitzin-Wilip (Z)	7.0 "	Magnetic $\mu=+ 0.43$	<u>AK</u> = 160
Galv. Period	10.6 "		

The constants of the Galitzin-Wilip are not reliable.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb. 1	i e eL M	9 18 10 28 33 35	7 20		
1	P i S i L M1 M2	20 29 32 42 32 18 31 33 18 36 15 50	18 10 10	15.0	
2		18 12			Feeble local tremors; R-F 6 at Hastings.
3	Pn iPq iPg Sn	1 30 20 22 31 34		1.2	Felt about Cook Strait, max. R-F 5 at Blenheim. Epicentre 41.4°S, 173.1°E.
3		5 26			Traces.
4	i eL	14 32 10 34			
6	iP i iS i i	10 55 48 59 56 01 03 06		1.15	Felt at Wanganui R-F 3-4
7	P? S	4 55 19 27		0.7?	P small and doubtful.
11	P i iS? i	3 14 31 53 55 57		2.1?	
12	i i i eL	5 06 53 11 38 19 32 27			Irregular movements.



DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Feb. 13	P S M	19 58 02 18 21		1.4	
14	P i S M	16 24 03 20 21 23		1.6	Felt at Farewell Spit, R-F 5 approx. epicentre 40.5S, 173 $\frac{1}{2}$ E.
16	P i S iM i i	12 28 38 45 29 11 13 15 17		2.9	Felt at Wairoa, R-F 4-5 approx. epicentre 39S 177 E. Also felt at Taihape, R-F 3.
17	P? S iM	7 37 43 39 20 24		3.3?	P very small. Deep focus type.
17		23 30			Traces, disturbed by micro- seisms.
21	P ipP? S ScS PPS? SS Lq? Lr M1 M2 M3 M4	7 15 40 16 14 25 55 26 25 27 25 31 36 40 45 40 48 53 58 8 04	24 27 23 20 19 13	82.1	Focal depth 100 km.+ Beginning doubtful.
22	e	3 14			Traces.
22	e	14 07			Traces.
23	eL M	1 31 43	16		
23	P S	5 48 26 35		0.8	
23	P i S iM	10 31 28 29 39 40		1.0	R-F 3 at Paekakariki.
23	e eL M	19 02 04 07	14		
25	e	12 57			Traces
28	P i i i S iM	7 38 35 40 44 49 55 39 06		1.7	R-F 3 at Wanganui and Marton felt also at New Plymouth.

In addition small local tremors were recorded as follows: 7d 5h 21m;
Feb. 3d 2 h 41m; 3d 2h 42m; 7d 8h 27m; 7d 12h 26m; 11d 15h 40m;
12d 0 h 28m; 16d 13h 56m; 20d 21h 12m; 23d 5h 37m; 23d 23h 59m;
23d 7h 05m; 24d 4 h 54m; 25d 11h 02m; 25d 11h 32m; 26d 4h 51m; 27d 13h 12m;

A R A P U N I

Milne-Seismograph; E-W component, undamped, Pend. Period = 24 sec.
(1937 Jan.); Magnification = 5.6



International
Seismological
Centre

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Feb. 1	e	9 26			Tremors.
21	iPPS? e Iq? M	7 27.0 37.0 40.0 48			
23	e	19 01			Tremors.

R O T O R U A.

Milne-Jagggar Seismograph; E-W Component.

Local tremors were recorded as follows on Feb. 4d 14h+ and 19d 0h 30m
but it is doubtful whether these were of seismic origin.

T U A I.

Milne-Jagggar Seismograph; E-W component.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb. 16		12 30			Small tremor.

N E W P L Y M O U T H.

Wood-Anderson Short-period Seismograph, E-W component.
Pend. Period = 0.78 sec.

Magnetic damping 10.1 (1937 Jan.)

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb. 3	Pn iPq i? iP* i? iPg Sn	1 30 38 42 47 50 52 56 31 03		2.45	
3	i i	14 12 56 58			Local.
5	P? i i?	22 48 15 18 20			Very small and uncertain. Interrupted by minute mark.



DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Feb. 6	P S	10 55 46 56 03		1.5	
12	P S	0 27 33 41		0.7	
13	P S	19 58 05 21		1.4	
14	P S	16 24 10 27		1.5	
16	iP	12 28 26			Prolonged local shock with no other prominent phases. Prolonged tremors; no clear phases.
17		7 37			
21	P? S? L?	7 19 28 29 54 49			Distant Shock.
22	P S?	2 05 22 25		0.3?	
28		7 38			Record too faint for measure- ment.

In addition small local tremors were recorded as follows.

Feb. 7d 5h 23m; 7d 8h 27m; 10d 22h 15m;

STRATFORD.

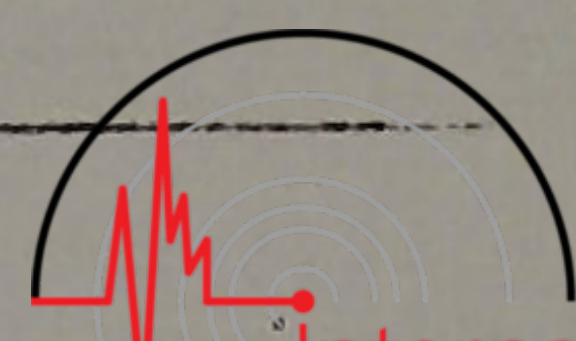
Milne-Jaggur Seismograph: E-W component.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb. 28	iM i i	7 38 (0) 5 12			

HASTINGS.

Milne-Jaggur Seismograph; NE-SW component.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb. 1		3 52			Local tremor.
2	P? S	18 11 (30) 33		0.3?	Felt locally R-F 6 phases not clear.
2		18 31			Local shockp
2		18 36			Local shock.



DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb. 2	P S	21 0 (0) 1		0.1	Very local; phases not clear Felt locally R-F 5.
3		3 18			Local shock.
3		3 19			Local shock.
16	P i is?	12 28 (0) 7 9		0.8?	
22	P i i	23 06 (0) 5 9			

T A K A K A.

Milne-Jaggard Seismograph: E-W component.

DATE 1937	PHASE	G.M.T. H.m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb. 3		1 31			
18		6 47			Local
23		21 02			"
28	P? S	7 38 (00) 10		0.9?	P small and doubtful.

CHRISTCHURCH (MAGNETIC OBSERVATORY)

(Earthquakes within about 10° only, as recorded on Wood-Anderson Seismograph. For more distant earthquakes, see special report of the Magnetic Observatory on page 8)

Wood-Anderson Short-period Seismograph; E-W component, magnetic damping, Pend. period = 0.8 sec; damping = 0.85.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb. 3	Pn iP* iPg i? Sn	0 30 33 45 51 55 58		2.15	P small and uncertain.
3		14 14			Small local tremor.
7	P? S	20 22 48 23 00			Local tremor? P small.
7		21 36			Local tremor
7		21 43			" "
8		4 46			" "
8	i? i M	20 25 58 26 06 13			Very feeble.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Feb.16	i	12 29 13			
17	P? iS iM	7 38 01 39 19 22		6.9?	P very doubtful.
19		23 20			Small tremors; may not be seismic.
21		3 14 59		" "	
27		6 45 5		" "	
28	ip? i i S i	7 39 15 20 41 45 54		2.1?	P doubtful.



N O T E S.

(1937 February)

No earthquakes were recorded during the month at BUNNYTHORPE, GREYMOUTH, and MONOWAI.

The seismograph at EAST CAPE is temporarily out of action, and the seismograph at KAITIAI was under adjustment during the month: Consequently no records were available from these stations.

PROVISIONAL EPICENTRES IN NEW ZEALAND AND SOUTH-WEST PACIFIC, 1937 JANUARY.

Origin Time (G.M.T.)	Provisional Epicentre	Focal Depth	Remarks.
1937 d h m	Lat. Long. (Deg) (Deg)		
Jan.23 10 56	7 S 153 E	90 km.	Epicentre from Riverview, Christchurch, Wellington, Manila, Hong Kong.
25 06 34	25 S 161 E	140 km±	Epicentre from Riverview, Wellington, Christchurch, Manila.

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological reports, received during the month of February, 1937p

Phu Lien.	. . .	June and July 1936.
Gottingen	. . .	April - June, 1936.
Chiufeng.	. . .	December, 1936.
Manila	. . .	January, 1937. Preliminary.
Taihoku	. . .	November and December, 1936. Preliminary.
Kew	. . .	December, 1936.
Adelaide.	. . .	January, 1937. Preliminary.
Ksara	. . .	December, 1936.
Riverview	. . .	January, 1937
Melbourne	. . .	October and November, 1936.
Central Station,	Jesuit Seismological Ass.	November, 1936. Preliminary
Phu Lien.	. . .	October and November, 1936.
Uccle	. . .	July - September, 1936.
Pasadena.	. . .	November. Local Shocks.

San Fernando . . . November and December, 1936.
 Zagreb . . . July - September, 1935.
 Pennsylvania . . . July - December, 1936.
 Florissant . . . July - September, 1936.
 Central Station, Jesuit Seismological Ass. December, 1936. Preliminary.
 Gerogetown . . . Despatches, November and December.
 St. Louis. . . July - September, 1936.
 Pasadona . . . October, 1936. Also Local Shocks, October, 1936.
 Rathfarnham Castle . December, 1936.



MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN, FEBRUARY, 1937.

(Prepared by the Director, Magnetic Observatory, Mr. H.F.Skey)

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES, REMARKS.
Feb. 1d.	ePZ?	9.11.48	54.1 in microseisms.
	S	19.29	
	SR ₁	23.10	
	Lq	27.47	
	Lr	31.14	
1d.	Slight seismic activity centreing 19.21 ca		
1d.	ePNZ?	20.24.40	31.3 in microseisms.
	SN	29.54	
	LqE	32.03	
	Lr	33.49	
3d.	iP	1.31.00	a small near shock.
3d.		5.21 ca	slight seismic activity.
4d.	LqE	14.32.30	
	LrNZ	33.48	
8d.		9.15 ca	slight seismic activity.
12d.	P?	4.09.36	53.0? in microseisms.
	S	17.10	
	Lq?	22.04	
	LrEZ	26.30	
17d.	PNZ	23.32.11	40? 0
	SN	38.25	
	LqE	41.21	
	LrNZ	44.06	
21d.	iPNZ	7.15.46	88?6 dilatation followed by large compression.
	SKS	26.03	
	S	26.34	
	LqE	40.43	
	LrNZ	45.20	
22d.	eN	3.42.10	
	eNZ	48.06	
22d.	eP?	13.06.48	33?0? in strong microseisms.
	S	12.14	
	Lr	16.36	
23d.	PZ	0.59.32	105 [±]
	SKS	1.10.08	
	S	11.28	
	LqN	28.50	
	LrEZ	35.40	

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES, REMARKS.
Feb.23d.	S?	19.03.16	in strong microseisms.
	LqE	05.16	
	LrNZ	07.24	
25d.	P?	10.52.25	28°3?
	S	57.17	
	LqE	57.40	
	Lr	11.00.13	



DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

Tables used :—

(1) For normal earthquakes—

(a) Tables, by H. Jeffreys and K. E. Bullen, 1935.

(b) Pasadena Travel-time Curves, by B. Gutenberg and C. F. Richter, 1934.

(2) For deep earthquakes—

(a) Depth, Time, and Distance Chart, by G. J. Brunner.

(b) Tables by K. Wadati and K. Masuda.

Determination of focal depth is made by means of the Brunner Chart ; and by the methods due to K. Wadati (Bull.Eq.Inst., vol. 9, p. 494, 1933) and to R. C. Hayes (Dominion Observatory Bulletin 107).

In these reports, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
East Cape ..	37° 40' S	178° 35' E	505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' E	212	Rhyolite tuffs ..	Powerhouse Superintendent.
Tuai ..	38° 48' S	177° 9' E	960	Gravels	Resident Electrical Engineer.
New Plymouth ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	(a) Superintendent, the Prison. (b) Mr. C. E. Morshead.
Stratford ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Mr. A. W. Burrell.
Hastings ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Mr. H. de Denne.
Bunnythorpe ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Mr. W. A. Waters.
Takaka ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	The Postmaster.
Greymouth ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels	District Engineer, P.W.D.
*Glenmuick ..	42° 54' S	173° 9' E	247	Gravels	Mr. C. J. Westland.
Christchurch ..	43° 32' S	172° 37' E	25	Gravels	Director, Magnetic Observatory.
Chatham Islands	43° 57' S	176° 31' W	210	Volcanic breccia ..	Superintendent, Radio Station.
Monowai ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Mr. W. H. Hutton.

* Privately-owned station.

[1,500/6/36—3636

WELLINGTON, (DOMINION OBSERVATORY)

Observer: W.M.Jones

Acting-Director: R.C.Hayes.



INSTRUMENTS AND CONSTANTS:

	Pend. Period	Damping	Magnification.
Milne Shaw (N-S)	10.2 sec.	Magnetic 23:1 (1937 Feb.)	250
Wood-Anderson (N-S)	0.55 "	" 8:1 (1936 Dec.)	-
Imamura (N-S)	5 "	Oil 10:1 (1937 Jan.)	2
" (E-W)	5 "	" 10:1 (" ")	2
" (Z)	4 "	" 1.2:1 (" ")	2
Galitzin-Wilip (Z)	7.0 "	Magnetic $\mu=+0.43$	$\frac{AK}{\pi L} = 160$
	Galv. Period 10.6 "		

The constants of the Galitzin-Wilip are not reliable.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Mar. 1	P i i S iM i i	6 56 33 47 54 57 32 58 02 17 20		5.2	Felt at Motu, R-F 3 and Opotiki. Epicentre $38\frac{1}{2}^{\circ}S$, $179\frac{1}{2}^{\circ}W$
1	P? i i	10 39 44 54 58			Local
5	P S	11 03 13 28		1.2	Local
7	P i i S	1 51 12 19 24 28		1.3	Local
8	i S	8 14 35 38			Felt at Cape Campbell, R-F 4
8	P i S iM i	19 14 13 16 23 24 29		ca 0.5	
9	e e eL M	16 09 15 30 37	20 17		
12	eL M	17 11 18	10		
14	i i eL M	1 54 24 57 12 2 06 08	20		
14	P SKS S? PS? i eLq? Lr	12 08 49 19 41 20 10 55 23 14 32 37	28	90 \pm	



DATE 1937	PHASE	G.M.T. h.m.s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Mar. 15	eL	6 34			
15	P? S i iM	17 30 36 49 51 53		1.2?	P very small.
16	P i i S i	2 32 51 58 33 06 17 26		2.3	Felt at Waipawa, R-F 4, Waipukurau and Omakere.
23	i e eL M	0 55 06 1 04 00 14 20 17	25 20		
24	P i S iM	17 16 46 50 52 58		ca 0.4	Felt at Wellington R-F 4, and in Cook Strait area from Wanganui to Cape Campbell. Epicentre 41°S, 174.4°E
24	P S i	20 26 53 59 27 04		0.5	Probably from nearly the same focus as preceding.
28		9 51			Traces of distant shock.
30	P i i i S i i	2 07 20 24 27 39 09 16 43 10 15		10.3	Epicentre about 37°S, 174°W
30	eL	7 38			
30	eL	15 02	18		

In addition small local tremors were recorded as follows: 1d 0h 10m;
4d 23h 4m; 7d 3h 16m; 8 d 5h 41m; 8d 21h 29m; 12d 0h 58m;
12d 5h 39m; 13d 20h 42m; ; 16d 19h 10m; 22d 23h 27m; 24d 22h 25m;
27d 8h 21m; 28d 0h 9m; 29d 8h 42m; 31d 21h 11m.

K A I T A I A.

Lat. 35° 6' S., Long. 173° 20' E. Height above M.S.L.=300ft. (approx.)
 Lithologic Foundation - Clays.
 INSTRUMENT: Milne-Shaw Seismograph, E-W component, Period T=10sec.,
 damping 23:1.

OBSERVER: Mr. C. B. Michie, Kaitaia.



DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Mar. 9	e eL	16 35 41½	20±		Prolonged movements.
This station has not been recording during the latter part of the month owing to adjustments being made.					

A R A P U N I.

Milne-Seismograph; E-W component, undamped, Pend. period= 24 sec.
 Magnification = 5.6

Mar. 1	P S	6 56 06 40		3.0	
--------	--------	---------------	--	-----	--

T U A I.

Milne-Jaggat Seismograph; E-W component.

Mar. 1	P i S iM i	6 56(0) 15 30 34 38		2.6	
--------	------------------------	---------------------------------	--	-----	--

N E W P L Y M O U T H.

Wood-Anderson Short-period Seismograph, E-W component.
 Pend. Period = 0.78 sec. Magnetic damping 10:1 (1937 Jan.)

Mar. 1		6 56			Record too faint to read.
21		9 38 02			Local tremors
21		20 36 24			" "
22	P S	12 45 06 09		0.3	
24	P S	17 17 17 40		2.0	
30	iM P i i S i i	2 07 22 26 29 09 18 43 10 15		10.3	

H A S T I N G S.

Milne-Jaggard Seismograph; NE -SW component.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Mar. 1	P? i i i S?	6 56(0) 7 10 25 34		3.0?	
16	P i iM i	2 32 (0) 8 15 23			

The Seismograph was out of action from 25th to end of the month owing to absence of the observer.

CHRISTCHURCH (MAGNETIC OBSERVATORY)

Earthquakes within about 10° only, as recorded on Wood-Anderson seismograph. For more distant earthquakes, see special report of the Magnetic Observatory, on page 7.

Wood-Anderson Short-period Seismograph; E-W component, magnetic damping, Pend. period = 0.8 sec; damping 0.85.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Mar. 1	P? S	4 58 50 59 15		2.2	
1	P? i i S iM	6 57 11 27 58 01 35 59 07		7.7ca	
4		20 23 41			Tremor
5		4 53 54			"
24	i i S	17 17 42 52 18 04			P lost in light-break
30	S?	2 10 21			

N O T E S.

(1937 March)

No earthquakes were recorded during the month at ROTORUA, BUNNYTHORPE, STRATFORD, TAKAKA, GREYMOUTH, and MONOWAI.

Earthquakes not recorded on any instrument were reported as felt at the following places: WESTPORT: March 7d 15h 45m, R-F 2; 7d 15h 53m, R-F 3; 18d 14h 55m, R-F 4. WAIPAWA: 30d 15h 16m, R-F 4.

PROVISIONAL EPICENTRES IN NEW ZEALAND AND SOUTH-WEST PACIFIC, 1937
FEBRUARY.



Origin Time (G.M.T) 1937d h m	Provisional Epicentre Lat. Long. (deg) (deg)	Focal Depth	Remarks
Feb.3 01 30	41.4S 173.1E	Normal	Felt about Cook Strait.max. R-F 5.
14 16 24	40.5S 173.5E	Normal	Felt at Farewell Spit. R-F 5.
16 12 28	39 S 177 E	Normal	Felt in North Island. max. R-F 5.

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological reports received during the month of March, 1937.

Del Ebro	July - September, 1935.
Pasadena	November 1936
Trieste	January - March 1936.
Ottawa	Dec. 1936
Strasbourg	December 1936.
Union Geodesique et Geophysique Internationale	December 1936.
Bureau Central	December 1936
Parc St. Maur	December 1936
Granada	January - May 1936.
Hong Kong	January 1937 Preliminary
Tauhoku	January 1937 Preliminary
Riverview	February 1937
Manila	December 1936
Manila	January 1937 Preliminary
Koti	July - December 1933 and 1934
Perth	November & October, 1936
Manila	January 1937 Special bulletin.
Ksara	January - December 1934.
Tananagerive	May - July 1936
Scoresby Sund	Nos. 11, 12, 13, 32, 33
Riverview	January 1937
Manila	February 1937 Preliminary
Adelaide	January 1937 Preliminary
Hong Kong	January 1937 Preliminary
Bucarest	October, 1936.
Chiufeng	January 1937.
Hong Kong	December 1936
Phu Lien	January 1937 Preliminary
Kew	January 1937
Bulletin of Seismographic Stations:	
Berkeley	
Mount Hamilton,	
Palo Alto	
San Fransisco	
Ferndale	For October - December 1936. Vol.5 No.3.
India Weather Review:	
Agra	
Bombay	
Calcutta	
Kodaikanal.	for January - December 1936.
Manila	February 1937 Preliminary
Hong Kong	February 1937 Preliminary
Hong Kong	January 1937
Perth	December 1936
Manila	January 1937
Manila	February 1937 Preliminary
Praha (Prague)	October - December 1936



Bureau Central July 1936
 Union Geodesique et Geophysique July 1936
 Internationale
 Strasbourg July 1936
 Parc St Maur July 1936
 U.S.Coast & Geodetic Survey . February Preliminary

MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN - MARCH 1937.
 (Prepared by the Director, Magnetic Observatory.)

DATE	PHASE.	G.M.T.	DISTANCE IN DEGREES - REMARKS.
1d.	eLNE eLZ	2. 01.54 03.48	Small
1d.	e e i i G LrNZ	6. 57.44 58.36 59.20 59.38 59.56 7.01.44	
9d.	ePEZ? iPEZ PRIE iSE SR1E SR2E GN LrE LrEZ	16.05.07 05.13 8.02 14.33 19.11 21.50 25.01 28.40 30.40	small compression. compression, from west. small. larger.
14d.	iP iS GE LrNZ MN iPZ ipPZ? eSKS iS iNE isSE? GN LrEZ	1.55.15 2.01.48 4.30 7.43 11.14 12.08.48 9.40 18.54 19.50 20.11 21.30 29.30 37.30	43.1, compression 96? dilatation, largest phase, 240 km deep? large on E. The small surface waves fit 86 deg. approximately, but G and an abnormal Lr do record from some deep shocks.
16d.		15.24 ca	Slight seismic activity.
19d.	ePE? iSE SR1 GN Lr	18.24.43 34.46 40.10 47.23 51.19	79.2?
23d.	iP iS GN LrEZ	0.55.08 1.03.48 10.40 14.40	63.6, compression
24d.	Pulsations from near shock commenced in hour gap near 17.17.38.		
28d.		9.50 ca.	Slight seismic activity.



DATE	PHASE	G.M.T.	DISTANCE IN DEGREES - REMARKS.
30d.	PN	14.57.37	17.9
	SN	01.01.	
	GE	01.51	
	LrNZ	03.13	
31d.	PZ?	16.00.00	110 [±] , compression, in microseisms.
	PR1N	04.29	
	SKKSN	11.47	
	PS?N	13.46	
	SR2	20.08	
	GE	31.43	
	LrNZ	38.07	

The Director of the Christchurch Magnetic Observatory acknowledges with thanks receipt of the following seismological publications:

Riverview	Nov.-Feb. 1936/37
Konigsberg	No. 24.
Sydney	Oct.-Dec., 1936.
St. Louis	pp 12 - 19.
Florissant	pp 27 - 30.
Central Station	pp 24 - 29 for 1936. pp 1 - 2, 1937. Prel. Bull.
J.S.A.	
Little Rock	pp 11 - 13.
Tokyo	Imp. University, S.R. of E.R.I., Pts. 1 & 2, 1936
"	" " " " pt.4 Vol.14 Dec.'36.
Academia Sinica,	Vol.5 No. 1 July - Sept. 1936.
Seismische Berichte der Wurttembergischen Erdbebenwarten	Jahrgang, 1935
Apia	Oct. - Dec. 1936
Melbourne	No.36
Pennsylvania	July - Dec. 1936
Pasadena	Oct. - Nov. 1936
Cartuja (Granada)	1936
Ksara (Liban)	1934
Northern California,	Vol.5, No. 3, Oct. - Dec., 1935.

2nd QUAR

Bulletin E 61 1937 Apr

1937

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

Tables used :—

(1) For normal earthquakes—

(a) Tables, by H. Jeffreys and K. E. Bullen, 1935.

(b) Pasadena Travel-time Curves, by B. Gutenberg and C. F. Richter, 1934.

(2) For deep earthquakes—

(a) Depth, Time, and Distance Chart, by G. J. Brunner.

(b) Tables by K. Wadati and K. Masuda.

Determination of focal depth is made by means of the Brunner Chart ; and by the methods due to K. Wadati (Bull.Eq.Inst., vol. 9, p. 494, 1933) and to R. C. Hayes (Dominion Observatory Bulletin 107).

In these reports, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
Kaitaia ..	36° 6' S	173° 20' E	300	Claystones ..	Mr. C. B. Michie.
East Cape ..	37° 40' S	178° 35' E	(approx.) 505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' E	212	Rhyolite tuffs ..	Powerhouse Superintendent.
Rotorua ..	38° 8' S	176° 15' E	930	Rhyolitic silts and gravels	Mr. Tregear, Government Tourist Bureau.
Tuai ..	38° 48' S	177° 9' E	960	Gravels ..	Resident Electrical Engineer.
New Plymouth ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	Superintendent, the Prison.
Stratford ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Mr. A. W. Burrell.
Hastings ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Mr. H. de Denne.
Bunnythorpe ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Mr. W. A. Waters.
Takaka ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	The Postmaster.
Greymouth ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels.	District Engineer, P.W.D.
Christchurch ..	43° 32' S	172° 37' E	25	Gravels ..	Director, Magnetic Observatory.
Chatham Islands ..	43° 57' S	176° 31' W	210	Volcanic breccia ..	Superintendent, Radio Station.
Monowai ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Mr. W. H. Hutton.

The Bulletin is now divided into two parts: Part I contains separate reports of distant earthquakes from Wellington, Christchurch, Arapuni, and Chatham Islands; Part II, the collected observations from local stations of local earthquakes (within 10° of Wellington)

PART I. DISTANT EARTHQUAKES.

Stations[‡] and Instruments:-

WELLINGTON (Dominion Observatory) Central Station.

Acting-Director: R.C.Hayes. Observer: W.M.Jones.

Milne-Shaw, N-S component.	Pendulum Period	9.5	sec.
Galitzin-Wilip, Z "	"	7.0	"
	Galvanometer	10.6	"

CHRISTCHURCH (Magnetic Observatory)

Director: H.F.Skey.

Galitzin, N-S, E-W, and Z components.

ARAPUNI

Milne, E-W component, Pendulum Period 24 sec.

CHATHAM ISLANDS

Milne, NE-SW component, Pendulum Period 15 sec.

[‡] see also particulars of stations on front page.

WELLINGTON.



DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
April 1	eL	17 29			Irregular movements until 18h 20m.
3	eL M	4 09 18	19		
5	P i PP iPPP? S ScS SS Lq Lr M	7 06 07 35 08 07 09 31 13 53 16 32 17 58 20 10 23 30	23 18	55.8	
5	i i L	23 46 29 48 33 06			
8	e M	15 08 23 15	17		
11	e L M	6 30 35 36 05 38	18 14		
16	eP iP pP? sP? iNZ eS iS pPcP sPcP ScP PcS ScS pScS? sScS	3 06 00 05 33 07 12 44 09 34 39 10 35 11 20 12 32 58 16 34 17 51 18 20		20.8	Felt at Tolaga Bay, R-F 2. Provisional epicentre 22 S 177.5 W. Focal depth 250 km. Well marked phase of 13 sec. period. Large on N-S component. Motion continued for 2½ hours.
21		5 33			Traces
23		14 11			Traces
28		14 18			Traces
29	e M	00 08 00 13	10		

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
April 29	i	19 16 39			
	i	17 34			
	eL	36 30			
	M1	40	26		
	M2	45	21		
	M3	48	19		
	M4	54	18		
29		21 14			Irregular movements.

CHRISTCHURCH.

Provisional Bulletin (as supplied by Director, Magnetic Observatory)

DATE.	PHASE.	G.M.T.	DISTANCE IN DEGREES - REMARKS.
Apr. 1d.	P?	17.26.41	30.4?, small, in microseisms.
	S	31.49	
	LqE	33.53	
	LrNZ	36.31	
3d.	eP?	3.59.40	46.5?, small, in microseisms.
	iSE	4.06.34	
	SR1	9.41	
	LqN	10.53	
	LrEZ	13.42	
5d.	iP	7.06.04	54.6, dilatation, large compression followed.
	iS	13.48	
	LqN	20.08	
	LrEZ	23.28	small.
	MEZ	27.26	
8d.	P	15.05.02	24.7, compression.
	iS	9.27	
	LqNE	10.38	Larger on N.
	LrZ	11.29	
11d.	ePZ?	4.50.18	
	ePNEZ?	50.21	
	iPZ	50.24	
	ePNE	50.25	
	iNEZ	50.50	
	iNEZ	51.56	very large.
11d.	PNZ?	6.22.42	54.0?, compression, in microseisms.
	SNZ	30.22	
	LqE	34.36	
	LrNZ	36.20	
16d.	iP	3 06.27	dilatation, az.n.n.e.
	iS?	10.22	very large, but tangled with later trace.
	iZ	10.31	
20d.	LqE	2.57.46	
	LrNZ	58.50	

DATE.	PHASE.	G.M.T.	DISTANCE IN DEGREES-	REMARKS.
Apr. 21d.	LqN LrEZ	5.32.49 39 43	60	second period. small; in large microseisms.
23d.		14.08 ca.		slight seismic activity.
23d.	ePNEZ iEN iEN iEN iEN iEN	16.50.47 51 54 58 51.02 07		R-F 5., S. by E?, Z defective. (It is probable that this shock was complex. After the possible later and larger shock a brief but marked tilt to S by W was recorded. Local tilt symptoms sometimes follow shocks off the East Coast of New Zealand.)
23d.	ePNEZ	16.54.43		R-F 3, similar origin, but without tilt.
23d.	ePNEZ	17.33.55		very small, do.do.
26d.	ePNEZ	3.26.11		A small near shock.
28d.	LqN LrEZ	14.16.38 18.04		Followed by shallow waves.
29d.	ePNZ? SZ LqE LrNZ	0.02.35 7.01 7.58 9.29		24.8?, compression, in microseisms.
29d.		1.39 ca.		a few surface waves.
29d.	PNZ SNZ LqE LrNZ	19.15.57 25.04 34.23 37.33	68.5.	42 second period.

ARAPUNI.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
April 5	P Lq M	7 06 0 19 0 33			
11		14 52 (50)			Traces
16	iP i S ScS?	3 05 (30) 07 (10) 08 (39) 17 (45)		18	
Apr. 16	iP i i S i	3 06 25 08 10 09 50 10 10 14 40		22	

PART II. LOCAL EARTHQUAKES.Index to Stations.†

- B BUNNYTHORPE - Jaggard, NW-SE.
 C CHRISTCHURCH - Wood-Anderson, E-W.
 E EAST CAPE - Jaggard.
 G GREYMOUTH - Jaggard. E-W.
 H HASTINGS - Jaggard, NE-SW.
 K KAITAIA - Milne-Shaw.
 M MONOWAI - Jaggard, E-W.
 NP NEW PLYMOUTH - Wood-Anderson E-W, Pend. period 0.78 sec.
 R ROTORUA - Jaggard, E-W.
 S STRATFORD - Jaggard, E-W.
 TA TAKAKA - Jaggard, E-W.
 TU TUAI - Jaggard, E-W.
 W WELLINGTON - Wood-Anderson, N-S, Pend. period 0.54 sec.
 Imamura, 3 components (for strong motion.)

The Stations at KAITAIA, EAST CAPE and STRATFORD are temporarily out of action.

NOTE: Determinations of absolute time are not attempted from the Jaggard records; only the intervals between pulses being measured.

Identifications of the various P and S pulses of near earthquakes are not included. As in many cases the P recordings are very small, the first P recorded is not necessarily P_n, or any other particular pulse.

† see also particulars of stations on front page.

DATE 1937	STATION*	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Apr. 1	W	i	2 43 49			
1	W	i	10 36 24			
1	W	i	17 53 54			
1	W	i	19 17 50			
2	V	P	5 34 29			
		i	35			
		i	39			
	C	iS	5 34 54			
2	W	eP	5 37 42			
		i	51			
5	W	P	4 40 02			
		S	09			
		iM	10			
		i	13			
5	W	i	22 02 40			
6	W	S?	03 32 10			
6	W	P	17 09 06		3.4	
		i	10			
		S	45			
		iM	47			
	C	S	17 10 46			
		iM	49			
7	W	P	14 22 43			
		S	55			
		i	56			
		iM	57			
	NP	S	14 23 10			
7	W	i	20 00,15			
8	W	P?	5 07 19			
		S	32			
		iM	33			
		i	36			
9	W	e	9 37 39		2.6	Felt at Waipawa, R-F 3.
		i	46			Approx. epicentre 39.7 S
		S	54			177.5 E.
		i	38 00			
		i	02			

* See page 6



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Apr. 9 (cont.)	NP	i S e iM ₁ ?S iM ₂ i i	9 37 38 54 9 37 (0) (5) (10) (17) (21)			
9	W	P S iM	9 56 20 28 30			
9	W	i	18 56 08			
10	W	P? i S iM	5 44 36 55 57 59			
10	W	P i i i S iM i i S?	6 48 37 42 49 49 00 04 09 11 16 6 48 49		2.6	
10	W	P i i i i S iM i i S	8 41 20 25 28 30 34 35 39 41 45 8 41 39		1.3 ca.	
11	W	P i i S i i i eL M P? S P? i i S? iM	4 50 58 16 51 47 52 21 28 47 53 04 35 54 25 4 51 16 52 56 4 50 21 24 30 51 20 56		7.4 8.9? 5.2	Felt at Puysegur Point, R-F 5+; Invercargill R-F 4. Epicentre 45 $\frac{1}{2}$ S, 166 W

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Apr. 11 (cont.)	M	P i i S iM i i	4 49 (0) (4) (9) (14) (23) (52) 50 (14)		1.2	
11	W	i S	21 38 02 05			
13	W	P i i i i S iM i i	4 15 25 28 37 40 16 00 03 04 08 11		3.3	Felt at Waipawa R-F 4; and Hawkes Bay district. Epicentre 40.8 S, 179 E. Depth of focus probably greater than normal.
	H	eP i i i S i iM i i	4 15 (0) 7 13 18 22 32 37 43 50		2.0	
	TU	i P i i i i S i P i i S	4 15 (0) 8 11 14 16 24 27 33 4 16 01 25 38 17 02		2.4	
	C	P i i S iM i	4 16 01 25 38 17 02		5.4	
13	W	P S iM i	6 10 35 11 11 13 16		3.2	
14	W	eP i S iM i i	4 48 08 25 50 52 55 58		3.7 ca	

DATE 1937	STATION	PHASE	G M T h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Apr. 15	W	i	11 47 49			
17	W	i	10 10 50			Small felt at Taihape.
17	W	i	10 11 10			
17	W	i	23 03 06			
18	W	i	04 11 05			
18	W	i	13 31 01			
18	W	i	13 59 17			
18	W	i	23 29 00			Small, felt at Taihape.
19	W	S? iM i i	9 19 42 43 48 57			
19	W	i	14 24 58			Tremor
19	W	eP S	23 55 01 16			
20	W	eP i iS? iM i	8 59 17 21 52 55 59			
20	W	S?	11 08 02			
20	H	i iM i i	22 17 00 2 5 8			
20	W	P i i iM S iM P? S? i	22 21 35 41 48 22 04 17 37 22 21(0) 12 23		3.7 0.6 ca.	Felt at Motu R-F 3; and Opotiki. Epicentre 38.4 S 177.6 E.



DATE 1937	STATION	PHASE	G.M.T. PERIOD h. m. s. sec.	Δ deg.	REMARKS.
Apr. 20 (cont.)	NP	P	22 21 23	2.9	Well marked? local disturbances.
	H	S	57		
		P?	22 21 (0)		
		S	10		
		iM	11		
		i	14		
C	i	16			
	i	46			
	S?	22 23 20			
	iM	27			
	i	43			
22	W	P	7 26 17		
		S	21		
22	W	i	9 47 15		
22	W	i	10 11 09		
23	C	i	16 50 48		Felt at Akaroa, R-F 4, and Christchurch, R-F 2+. Epicentre of this and following two shocks pro- bably about 43.75 S, 173. 25 E. (See also Christchurch report on page 4.) Small amplitudes.
		i	51		
		iM	51 15		
	W	i	16 51 42		
		i	52 00		
		S	13		
23	C	i	16 54 43		
		i	45		
23	C	i	17 33 55		
		i	58		
23	W	P	21 13 18	1.3	
		i	20		
NP	S	33	21 13 (0)	1.4	
	P	(0)			
	S	(16)			
24	W	i	1 56 33		
25	W	P?	4 16 55	2.0? P very small.	
		S	17 18		
		iM	20		
		i	25		
		i	30		
	C	S?	4 18 23		
i		30			
	i	33			

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS
Apr. 25	W H C	i? S i iM i S? i	10 08 20 37 40 10 08 (0) (4) (23) 10 09 38 48		1.5?	P very small. Felt at Waipawa, R-F 4, and Taihape, R-F 3.
25	W	i	23 52 32			
26	C	P S	3 25 56 26 36			
26	W	i i	12 08 57 09 03			
26	W	i	17 31 15			
28	W	P i S iM	18 04 06 13 19 34		1.2	Felt at Dannevirke, R-F 3.
29	W	P i i S iM	10 19 55 58 20 02 13 18		1.6	
29	C		13 33 32			Traces; shock felt at Oamaru, R-F 3.
30	W	i S	14 57 00 04			

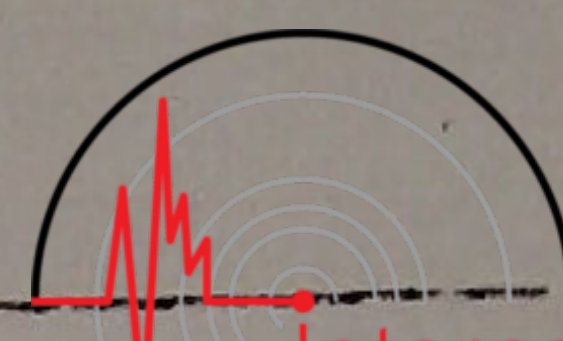
NOTE: Earthquakes, not recorded on any instrument, were reported felt during the month as follows:

April 1d 5h 28m Whakatane R-F 5
29d 13h30m Oamaru R-F 4

A total of 17 earthquakes were reported felt during the month; the greatest intensities reported being at Whakatane R-F 5; and at Puysegur Point, R-F 5.



PROVISIONAL EPICENTRES IN NEW ZEALAND
AND SOUTHWEST PACIFIC. 1937 MARCH.



International
Seismological
Centre

ORIGIN TIME (G.M.T.) 1937 d.h. m.	PROVISIONAL EPICENTRE		FOCAL DEPTH	REMARKS.
	Lat. (deg)	Long. (deg)		
March 1 06 55	38.5 S	179.5 W	Normal	Felt at Motu, R-F 3, and Opotiki.
24 17 16	41 S	174.4 E	Normal	Felt about Cook Strait, R-F 4.
30 02 06	37 S	174 W	Normal	



The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological reports received during the month of April, 1937:

Scheizerisches Erdbebenbulletin No. 81.	
Taihoku	Preliminary February, 1937
Ksara	Preliminary January, 1937
Ottawa	January, 1937
Hamburg	October - January-February 1936/37
Little Rock	June 1936
Central Station J.S.A.	Preliminary December, January 1936/37
Union Geodesique et	
Geophysique Internationale	January 1937.
Strasbourg	January 1937
Parc St. Maur	January 1937
Bureau Central	January 1937
U.S.Coast & Geodetic Survey	Preliminary reports 1937.
Chiufeng	February, 1937
Ksara	Preliminary February 1937
La Plata	December 1936
Florissant	October 1936
J.S.A.	March 9, 1937
J.S.A.	February 21, 1937
Florissant	August 1936
Adelaide	Preliminary February.
Riverview	March 1937
Kew	February 1937
Apia	January - March 1937
U.S.Coast & Geodetic Survey	September 1935.
Bucarest	January 1937
U.S.Coast & Geodetic Survey	July, August 1935.
Manila	March preliminary
Sydney	January 1937
Ottawa	February 1937
Pasadena	December, Local shocks, 1936.
Phu Lien	Preliminary February 1937.
Manila	March 14th Preliminary
Hong Kong	February 1937.

.....000.....



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

Tables used:—

(1) For normal earthquakes—

(a) Tables, by H. Jeffreys and K. E. Bullen, 1935.

(b) Pasadena Travel-time Curves, by B. Gutenberg and C. F. Richter, 1934.

(2) For deep earthquakes—

(a) Depth, Time, and Distance Chart, by G. J. Brunner.

(b) Tables by K. Wadati and K. Masuda.

Determination of focal depth is made by means of the Brunner Chart; and by the methods due to K. Wadati (Bull. Eq. Inst., vol. 9, p. 494, 1933) and to R. C. Hayes (Dominion Observatory Bulletin 107).

In these reports, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
Kaitaia ..	36° 6' S	173° 20' E	300	Claystones ..	Mr. C. B. Michie.
East Cape ..	37° 40' S	178° 35' E	(approx.) 505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' E	212	Rhyolite tuffs ..	Powerhouse Superintendent.
Rotorua ..	38° 8' S	176° 15' E	930	Rhyolitic silts and gravels	Mr. Tregear, Government Tourist Bureau.
Tuai ..	38° 48' S	177° 9' E	960	Gravels ..	Resident Electrical Engineer.
New Plymouth ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	Superintendent, the Prison.
Stratford ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Mr. A. W. Burrell.
Hastings ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Mr. H. de Denne.
Bunnythorpe ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Mr. W. A. Waters.
Takaka ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	The Postmaster.
Greymouth ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels.	District Engineer, P.W.D.
Christchurch ..	43° 32' S	172° 37' E	25	Gravels ..	Director, Magnetic Observatory.
Chatham Islands ..	43° 57' S	176° 31' W	210	Volcanic breccia ..	Superintendent, Radio Station.
Monowai ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Mr. W. H. Hutton.

PART I.DISTANT EARTHQUAKES.Stations * and Instruments:

WELLINGTON (Dominion Observatory) Central Station.

Acting-Director: R.C.Hayes.
Observer: C.N.M.Watson-Munro.

Milne-Shaw, N-S component.	Pendulum Period	9.5 sec.
Galitzin-Wilip, Z	"	7.0 "
	Galvanometer	10.6 "

CHRISTCHURCH (Magnetic Observatory)

Director: H.F.Skey.

Galitzin, N-S, E-W and Z component.

ARAPUNI.

Milne, E-W component, Pendulum Period 24 sec.

CHATHAM ISLANDS.

Milne, NE-SW component, Pendulum Period 6 sec.

* SEE also particulars of stations on front page.

WELLINGTON.



DATE 1937	PHASE	G+M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
May 1	eL M	12 48 56			Maximum poorly defined.
1	eL	23 45			Traces
5	i	11 38 40			Irregular tremors.
9	eL M1 M2 M3	15 29 33 39 42	22 20 17		
10	eP1 eP2 iP i i i i eS iS i i i iPcP iScS	15 28 46 49 51 54 29 00 12 23 31 19 22 47 32 06 15 33 34 39 20		13.3	Provisional Epicentre 26 S, 177 E. Focal depth 600 km.+ Surface waves absent, or very small
12	iP ipP e iPcP? ipPcP? ePPP epPPP iS esS eSS? sScS? eL M1 M2	2 53 10 42 54 10 57 55 27 50 56 20 59 40 3 00 38 03 32 04 20 06 10 13		44	Focal depth about 150 km. May be ScS Surface waves small.
12	e M	9 59 10 01			Tremors
15		3 07			Traces
16	i i iL? M1 M2	11 48 50 50 00 50 30 51 53	18 16		Records disturbed by heavy microseisms.
20		3 33			Traces
23	i i eL? M	6 17 28 21 10 23 28			
28	e eL	3 27 45			Traces
31	P PcP S PcS? SS? Lr? L M	15 39 25 41 32 45 12 46 36 48 49 51 57	10 20 15	37.3	May be Lq. Maximum poorly defined.

CHRISTCHURCH.

(as prepared by the Director, Magnetic Observatory)
PROVISIONAL BULLETIN.

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS.
May 1	PZ?	12.30.40	63.6?	in microseisms.
	eS	39.20		
	PSE	39.49		
	eLqN	45.30		
	LrEZ	49.12		
	eM?	54.20		slightly shorter period.
1		16 15 ca.		a few surface waves
1		23.44 ca.		do. do.
2	ePNEZ	11.27.41		a near shock, R-F.4.
2	ePNEZ	11.30.37		do. do. R-F.3.
2	ePNEZ	19.37.31		do. do. R-F.3.
3	iP	7.25.47		Az. N.N.W.
	iNEZ	25.50		
	iNEZ	25.54		presumably an S phase as largest on E, also indicates az. N.N.W.
3	e	11.59.05		Small near shock barely on E.
3	eP	14.36.08		compression, NNW., R-F.2.
	SEZ	36.15		
5	SE	11.34.37		in microseisms.
	LqN	35.00		
	LrTZ	35.51		
5	LqN	13.28.17		small, in microseisms.
	LrEZ	30.01		
7	LNZ	15.00.10		a few shallow waves.
9	iPZ	15.10.06	87.4	compression, small, in microseisms.
	iNE	10.38		
	eSEZ	20.48		
	PSEZ	21.46		
	SR1	26.40		
	SR2N	30.32		
	LqE	33.48		
	LrNZ	39.32		
10	iPNZ	15.29.07	19	large compression, Az. N.
	ipPZ	29.39		SP?
	iSE	31.55		very large, probably 180 kmp
	iSNZ	31.56		smaller. deep.
	iPcPNZ	32.39		
	isSE	32.49		
	iE	33.12		
	iScSE	39.28		
	iE	40.30		small
11	ePZ?	15.02.13		small, in microseisms.
	eSNZ	08.30		
	Lq	11.17		
	Lr	13.30		
12	iPNZ	2.53.10	45	compression, 200 km. deep.
	ipPNZ	53.44		first three phases small or
	isPZ?	54.01		absent on E.
	iS	59.46		
	esSNZ	3.00.48		very small.
12	ePNZ?	9.50.46		small, in microseisms.
	eSEZ	56.42		
	LqE	10.00.43		
	LrNZ	02.43		
	iE	04.55		a conspicuous 13 second wave.
12	eP?	12.07.50		small, in microseisms.
	eN	12.11		
	iSE	13.45		
	eZ	13.45		no surface waves.

PART II.LOCAL EARTHQUAKES.Index to Stations.‡

- W WELLINGTON - (Dominion Observatory) Central Station.
Acting-Director : R.C.Hayes.
Observer : W.M.Jones.
- A ARAPUNI - Milne, E-W.
- B BUNNYTHORPE - Jaggar, NW-SE.
- C CHRISTCHURCH - Wood-Anderson, E-W.
- CH CHATHAM ISLANDS: Milne, NE-SW.
- E EAST CAPE - Jaggar
- G GREYMOUTH - Jaggar, E-W.
- H HASTINGS - Jaggar, NE-SW.
- K KAITAIA - Milne-Shaw. E-W
- M MONOWAI - Jaggar, E-W.
- NP NEW PLYMOUTH - Wood-Anderson, E-W, Pend.period 0.78 sec.
- R ROTORUA - Jaggar, E-W.
- S STRATFORD - Jaggar, E-W.
- TA TAKAKA - Jaggar, E-W.
- TU TUAI - Jaggar, E-W.

NOTE: Determinations of absolute time are not attempted from the Jaggar records; only the intervals between pulses being measured.

Identification of the various P and S pulses of near earthquakes are not included. As in many cases the P recordings are very small, the first P recorded is not necessarily P_n, or any other particular pulses.

‡ see also particulars of stations on pages 1 and 2.

DATE 1937	STATION	PHASE	G.M.T. h. m.s.	PERIOD sec.	Δ deg.	REMARKS.																																												
May 1	W	iS?	08 54 58																																															
	C	i	08 54 44			Tremor																																												
1	C		23 17 53			" "																																												
2	W		11 28 09			Traces																																												
	C	P	11 27 41			Felt at Christchurch, R-F 4.																																												
		i		43																																														
		iM		50																																														
		i	28 08																																															
2	W		11 32 01			Traces																																												
2	C	P	11 30 37			Felt at Christchurch R-F 3.																																												
		i		40																																														
		iM1		42																																														
		iM2		51																																														
		i		59																																														
2	C		11 37 12			Small																																												
2	W	P	18 21 06																																															
		S		15																																														
2	W	P	19 38 42			Traces																																												
			C	19 37 31			Felt at Christchurch R-F 3.																																											
					33																																													
					iM			41																																										
					i			54																																										
	i	38 02																																																
3	W	i	7 26 22			Felt at Christchurch R-F 4.																																												
		i		46																																														
		i	27 00																																															
	C	P	7 25 47																																															
		i		49																																														
		i		54																																														
		iM		57																																														
		i	26 13																																															
		i		21																																														
		i		25																																														
	i		42																																															
3	C	P	11 59 05																																															
		i		07																																														
		iM		13																																														
		i		18																																														
		i		22																																														
3	W	i	13 04 21																																															
		i		23																																														
3	C	P	14 36 08			Felt at Christchurch R-F 2.																																												
		S?		11																																														
		iM		15																																														
		i		31																																														
		i		35																																														
4	W	i	2 53 48																																															
4	W	S?	6 04 00																																															
		i		02																																														
4	W	P	17 18 13		3.4?	<table border="1"> <thead> <tr> <th>STATION</th> <th>DATE</th> <th>PHASE</th> <th>G.M.T.</th> </tr> </thead> <tbody> <tr> <td></td> <td>May 4</td> <td>W</td> <td></td> </tr> <tr> <td></td> <td></td> <td>i</td> <td>17 27 39</td> </tr> <tr> <td></td> <td></td> <td>iS</td> <td>46</td> </tr> <tr> <td></td> <td></td> <td>iM</td> <td>49</td> </tr> <tr> <td></td> <td></td> <td>i</td> <td>53</td> </tr> <tr> <td></td> <td></td> <td>i</td> <td>58</td> </tr> <tr> <td></td> <td></td> <td>S</td> <td>17 28 46</td> </tr> <tr> <td></td> <td></td> <td>i</td> <td>55</td> </tr> <tr> <td></td> <td></td> <td>i</td> <td>57</td> </tr> <tr> <td></td> <td></td> <td>i</td> <td>29 09</td> </tr> </tbody> </table>	STATION	DATE	PHASE	G.M.T.		May 4	W				i	17 27 39			iS	46			iM	49			i	53			i	58			S	17 28 46			i	55			i	57			i	29 09
		STATION	DATE	PHASE			G.M.T.																																											
			May 4	W																																														
				i			17 27 39																																											
				iS			46																																											
			iM	49																																														
			i	53																																														
			i	58																																														
			S	17 28 46																																														
			i	55																																														
		i	57																																															
		i	29 09																																															
C	S?		52																																															
	iM		54																																															
	i		57																																															
	S?	17 19 44																																																
	i		47																																															
	i		55																																															

DATE 1937	STATION	PHASE	G.M.T.			PERIOD sec.	Δ deg.	REMARKS
			h	m	s			
May 4	C	i	17	28	57			
		i		29	09			
4	W		17	54	33		Tremor.	
5	W	eP	13	23	41		Small.	
		i			46			
		i			52			
		i			54			
		i			57			
5	W		20	04	35		Tremor.	
6	W		7	59	15		" "	
6	C	P	15	29	01		Felt Hanmer Springs, R-F 3.	
		i			06			
		i			16			
		iM			21			
		i			26			
6	W		21	16	50		Tremor.	
8	W		11	05	32		" "	
8	W	P	14	26	37	1.8		
		S			57			
8	W		19	59	03		Tremor.	
9	W	P?	17	44	51	cal. 5	Felt Pongaroa R-F 4, also Masterton, Foxton, and Waipawa area.	
		i			57			
		i			59			
		i	45		02			
		S?			06			
		i			08			
		iM			11			
		i			13			
		i			15			
		i			20			
	B	i	17	45	(00)			
		iM			(05)			
		i			(15)			
9	W		21	49	05		Tremor.	
10	W	i	4	50	57			
		S			51 04			
		i			07			
		i			09			
10	W	i	15	36	37			
		i			39			
11	C	i	15	37	06			
	W	i	1	17	34		Tremor.	
	C	i	1	17	02			
11	W	i	4	25	56		Tremor.	
	C	S?	4	26	46			
11	W	S?	12	33	04			
		i			07			
		i			14			
13	W	P	11	58	18		Three shocks reported felt in Flaxbourne district on night of 13th; times not reported.	
		S			22			
		i			24			
13	W	S?	12	45	53			
13	W	P?	17	50	30	1.1?		
		i			34			
		S			42			
		i			45			
		i			47			
15	W	P	16	31	25	1.0	Two shocks reported felt in Flaxbourne district on night of 15th; times not reported.	
		i			28			
		eS			36			
		iM			40			
		i			42			
15	W	P	17	17	26	2.2		
		i			31			
		eS			51			
		iM			52			





DATE 1937	STATION	PHASE	G.M.T. h m s	PERIOD sec.	Δ deg.	REMARKS
May 16	W		0 06 41			Tremor.
16	C		5 12 40			" "
18	W		3 53 55			" "
18	W	i	16 59 33			
		i	39			
18	W	i	17 02 06			
		i	11			
19	W		7 53 12			Tremor.
19	W	iP	7 53 45		0.9?	Felt Wellington R-F 3, Havelock R-F 4; also Blenheim and Wan- ganui. Epicentre 41°S, 174°E.
		i	49			
		i	52			
		S	55			
		iM	58			
		i	54 04			
		i	09			
		i	11			
	C	eP	7 54 07		2.6?	
		i	14			
		i	26			
		i	32			
		S?	37			
		iM	40			
		i	43			
		i	50			
		i	55 02			
19	W	P	9 54 11		1.1	Felt from Wanganui to Parapar- aumu xx and eastward to Mast- terton and Pongaroa (max.R-F 4)
		i	15			
		S	21			
		i	23			
		i	25			
		i	28			
		i	35			
		iM	39			
		i	43			
	H	e	9 54(00)			
		i	03			
		iM1	05			
		i	11		0.9?	Felt Wellington R-F 3, Havelock R-F 4; also Blenheim and Wan- ganui. Epicentre 41°S, 174°E.
		i	15			
		iM2	20			
		i	32			
	B	P	9 54(00)			
		i	03			
		i	08			
		i	15			
		i	26			
19	W		12 00 52			
20	W	i	9 36 18			Felt Dannevirke, Palmerston North(R-F 5), and Hunterville. Epicentre probably in Ruahine Ranges.
		iM	27			
		i	30			
		i	36			
20	W	i	10 06 15			Felt Wairoa R-F 5, and Gisborne.
		S	33			
		iM	34			
	TU	i	10 05(00)		1.1	First two pulses sharply defined; epicentre apparently within 50 km.
		i	05			
		i	15			
		i	24			
20	W	P	14 52 40		1.1	Felt Masterton and Paekakariki, (R-F 4) and northward to Hunter- ville and Dannevirke. Epicentre perhaps in Tararua Ranges.
		i	44			
		i	47			
		i	50			
		S	52			
		iM	54			
		i	56			



DATE 1937	STATION	PHASE	G.M.T. h m s	PERIOD sec.	Δ deg.	REMARKS
May 20	W	i	14 53 06			
		i	33			
	C	i	14 53 51			Very small.
22	W		11 14 58			Tremor.
22	W		16 51 30			" "
23	W		12 04 59			" "
24	W	eP	1 23 06			Felt Masterton.
		S	17			
26	W	P	17 51 43		2.1?	
		S?	52 07			
		i	10			
		i	19			
28	W	eP	20 34 05			
		S	13			
		iM	15			
30	C		10 04 06			Tremor.
30	W	P	16 23 34		1.8	Felt Nelson R-F 4, Collingwood R-F 4.
		i	37			
		i	41			
		i S	55			Epicentre probably near 41°S, 172½°E.
		i	57			
		iM	24 00			
		i	04			
		i	08			
	C	P	16 23 43		2.3?	
		i	48			
		i	53			
		i	24 07			
		S?	09			
		i	11			
		i	21			
		i	31			

NOTES: No earthquakes were recorded during the month at ~~XXXX~~ Stratford, Takaka, Greymouth and Monowai. The stations at Kaitaia and East Cape are temporarily out of action, and the New Plymouth station was out of action during a large part of the month, owing to trouble with the recording apparatus.

Earthquakes not recorded on any instrument were reported felt during the month as follows :-

Oamaru 3d 9h 26m, R-F 2-3
 Whakatane 5d 23h 20m, R-F 3-4
 Dannevirke 9d 05h 41m, R-F 2
 Hammer Springs 6d 17h 25m, R-F 4
 Cape Campbell 16d 15h 09m, R-F 2
 Hicks Bay 17d 15m 53m, R-F 3
 Eketahuna 19d 15h, R-F 4?
 Wairoa 20d 10h 17m, R-F 4
 Dannevirke 20d 19h 30, ~~XXXX~~ Tremor.
 Whakatane 22d 15h 43m, R-F 5
 Tikitiki 25d 16h 30m, R-F 4?
 Rotorua 26d 08h to 19h A number of jolts, accompanied by rumbles.
 Dannevirke 29d 10h 34m, R-F 3
 Waipawa " " " " "

Thirty-three earthquakes were reported felt during the month, the greatest intensities reported being R-F 5 at Whakatane in the North Island, and R-F 4 at Hammer Springs in the South Island.

PROVISIONAL EPICENTRES IN NEW ZEALAND AND THE SOUTH-WEST
PACIFIC; 1937 APRIL.



ORIGIN TIME (G.M.T.) 1937 d h m	PROVISIONAL EPICENTRE		FOCAL DEPTH	REMARKS
	Lat. (deg)	Long. (deg)		
Apr. 9 09 37	39.7S	177.5E	Normal	Felt Waipawa, North Island, R-F 3
" 11 04 50	45.5S	166 E	-	Felt Southland, max.R-F 5
" 13 04 15	40.8S	179 E	Deep	Felt Hawkes Bay district, R-F 4
" 16 03 01	20 S	177.5W	250 km.	Felt Tolaga Bay, North Island, R-F 2
" 20 22 21	38.4S	177.6E	-	Felt Opotiki and Motu, R-F 3
" 23 16 50	43.75S	173 E	Normal	Felt Banks Peninsula & Christchurch, max.R-F 4

ERRATUM: Bulletin E 59, 1937 February, page 7., Earthquake of 1937
Jan.25d 06h 34m --- epicentre should read 11S, 163E.

The Director of the Magnetic Observatory, Christchurch acknowledges with thanks receipt of the following seismological publications :-

Hamburg 1936 Nos.20-25, 1937 Nos.1-2.
B.Gutenberg "On Microseisms".
" " and C.F.Richter, "Materials for the Study of Deep-focus Earthquakes!"
Apia No.1,1937.
Riverview March, April 1937.
J.S.A. Central Station, 1937 pp.3-5.
St.Louis pp 20-22
Florissant 1936, pp 31-35-47.
Little Rock, pp 14-16
Sydney 1937 Jan-Mar.
Pasadena Dec.1936
Batavia july-Sept.1936
North California Jan-June 1936.
Melbourne Bulletin 37.
Cartuja(Granada) june 1936.



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

Tables used :—

(1) For normal earthquakes—

(a) Tables, by H. Jeffreys and K. E. Bullen, 1935.

(b) Pasadena Travel-time Curves, by B. Gutenberg and C. F. Richter, 1934.

(2) For deep earthquakes—

(a) Depth, Time, and Distance Chart, by G. J. Brunner.

(b) Tables by K. Wadati and K. Masuda.

Determination of focal depth is made by means of the Brunner Chart ; and by the methods due to K. Wadati (Bull.Eq.Inst., vol. 9, p. 494, 1933) and to R. C. Hayes (Dominion Observatory Bulletin 107).

In these reports, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
Kaitaia ..	36° 6' S	173° 20' E	300	Claystones ..	Mr. C. B. Michie.
East Cape ..	37° 40' S	178° 35' E	(approx.) 505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' E	212	Rhyolite tuffs ..	Powerhouse Superintendent.
Rotorua ..	38° 8' S	176° 15' E	930	Rhyolitic silts and gravels	Mr. Tregear, Government Tourist Bureau.
Tuai ..	38° 48' S	177° 9' E	960	Gravels ..	Resident Electrical Engineer.
New Plymouth ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	Superintendent, the Prison.
Stratford ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Mr. A. W. Burrell.
Hastings ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Mr. H. de Denne.
Bunnythorpe ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Mr. W. A. Waters.
Takaka ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	The Postmaster.
Greymouth ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels.	District Engineer, P.W.D.
Christchurch ..	43° 32' S	172° 37' E	25	Gravels ..	Director, Magnetic Observatory.
Chatham Islands ..	43° 57' S	176° 31' W	210	Volcanic breccia ..	Superintendent, Radio Station.
Monowai ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Mr. W. H. Hutton.

1.

1931



PART 1.

DISTANT EARTHQUAKES.

STATIONS *and INSTRUMENTS:

WELLINGTON: (Dominion Observatory) Central Station.

Acting Director: R.C. Hayes.
Observer: C.M.M. Watson-Munro.

Milne-Shaw - N.S. component.	Pend. Period	9.9	sec.
Galitzin-Vilip-Z	"	7.0	"
	Galvanometer	10.6	"

CHRISTCHURCH: (Magnetic Observatory)

Director: H.F. Skey.

Galitzin - N-S, E-W, and Z component.

ARAPUNI:

Milne - E-W component, Pend. Period 24 sec.

CHATHAM ISLANDS:

Milne- NE-SW component, Pend. Period 6 sec.

* See also particulars of stations on front page.

WELLINGTON.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
June 6	e i eL	0 07 09 15 11			
7	e? eL M1 M2	15 23 25 27 28	11 10		Doubtful Large amplitude on horizon- tal.
8		4 07 ca			L waves of very small amplitude
8		10 53			" " " " " "
9	eL? i M	23 41 41 32 44	11		Maximum poorly defined.
14	P PP i i PPP S i iL M	12 35 25 30 37 49 36 02 38 24 40 18 42 18 44	20 15	16.2	
14	P? PP PPP i i i S PcP SS L M1 M2	13 15 04 24 40 16 00 44 18 15 58 19 04 40 21 23 24	11 7 14 15 12	21.8?	Small, confused with tail of previous shock.
15		10 09 ca			Very faint tremors.
19	iP i eS i i ScS	17 10 38 50 13 11 19 34 21 08		15.6ca.	Focal depth 600 - 700 km.
21	iPcP PP es? PS? SS e Lr M1 M2	15 26 30 30 20 38 25 39 10 45 40 54 40 57 50 16 01 04	20 19 16	100 ca	Strong vertical movement, may be reinforced by P May be ScS. Followed by train of waves with several subsidiary maxima.
23	e	7 08			Faint tremors, may be L wa- ves
28	eL M	19 37 39	16 ca		
28	i eL? M	23 49 22 50 40 52	12 12		

CHRISTCHURCH.

(as prepared by the Director, Magnetic Observatory)

PROVISIONAL BULLETIN.

DATE	PHASE	G. M. T.	DISTANCE IN DEGREES	REMARKS.
May 31	P PcP S eEZ eLqE iScS LqE LrNZ	15.39.34 41.46 45.26 48.28 48.40 48.57 49.30 51.30	36.7	Az. NNW? complicated soon after. regular 34 sec. period.
June 3	eP? SEZ LqE LrNZ	1.28.38 31.40 32.14 33.10	15.6?	
6		22h. ca.		slight seismic activity.
7	P? S Lq Lr MN	15.17.22 20.35 21.05 22.15 23.45	16.7?	Z defective.
8		3.30 ca.		slight seismic activity for 30 min. ca.
8	PZ S LqE LrNZ MNZ	10.08.45 16.25 21.00 24.55 29.09	54.	compression
14	iPNZ S iNZ LqE LrNZ ScSN	12.35.38 39.43 39.55 40.28 42.02 46.42	22.4 23.7?	compression PcP? S?, large on N
14	eNEZ iPZ iSN iZ	13.15.12 15.30 19.22 19.29		on coda of previous shock. compression.
15	eP S Lq Lr	10.04.45 08.47 9.27 11.31		in strong microseisms. Larger on E.
15		21.10 ca.		slight seismic activity in strong microseisms.
19	iPNZ iSE iNE	17.10.57 13.47 21.21	14.5	compression, from N. followed by pulsations. large on E, surface waves small.
21	iPEZ PRIEZ SKSNE SKKSNE iSN iPSE iPSNZ iPPSE iSR ₁ LqN LrEZ LZ ME	15.26.29 30.22 36.44 37.28 38.01 39.19 39.24 40.06 44.41 52.38 58.00 59.28 16.04.50	98.5±	large compression, earlier small dilatation just possible in microseisms 40 second period. larger, but shorter period.



DATE	PHASE	G M T	DISTANCE IN DEGREES	REMARKS.
June 23	Lq Lr	7.08.00 10.35		larger on E
24		14.05 ca		slight seismic activity in strong microseisms.
28	PZ? SE LqE	19.31.02 34.15 35.37	16.7?	
28	eP iEZ iNEZ	23.47.19 47.45 48.04		

ARAPUNI.

June 14	eS?	12 38 45		Tremors from distant shock.
14	iS	13 17 54		" " " "
19	eS	17 12 32		
21	eS? eSS Lr M	12 39 30 44 40 57 12 59	100 ca.	May be ScS.

NEW PLYMOUTH.

June 19	iP i i S i	17 10 26 36 11 02 12 52 13 05	14.6 ca	(Readings from Wood-Anderson)
---------	------------------------	---	---------	-------------------------------

PART II.LOCAL EARTHQUAKES.Index to Stations*

- W WELLINGTON - Dominion Observatory - Central Station.
Wood-Anderson, N-S pend. period 0.5 sec.
Imamura, three components:-
pend. periods. N-S = 6 sec.
E-W = 6 sec.
Z = 4 sec.
- Acting-Director : R.C.Hayes.
Observer : W.M.Jones.
- A ARAPUNI - Milne, E-W. (see p.1.)
- B BUNNYTHORPE - Jaggar, NW-SE.
- C CHRISTCHURCH - Wood-Anderson, N-S. pend. period 0.8 sec.
- CH CHATHAM ISLANDS - Milne, NE-SW. (see p.1.)
- G GREYMOUTH - Jaggar, E-W.
- H HASTINGS - Jaggar, NE-SW.
- K KAITAIA - Milne-Shaw, E-W.
- M MONOWAI - Jaggar, E-W.
- N NEW PLYMOUTH - Wood-Anderson, E-W, Pend. period 0.78 sec.
- R ROTORUA - Jaggar, E-W.
- S STRATFORD.- Jaggar, E-W.
- TA TAKAKA - Jaggar, E-W.
- TU TUAI - Jaggar, E-W.

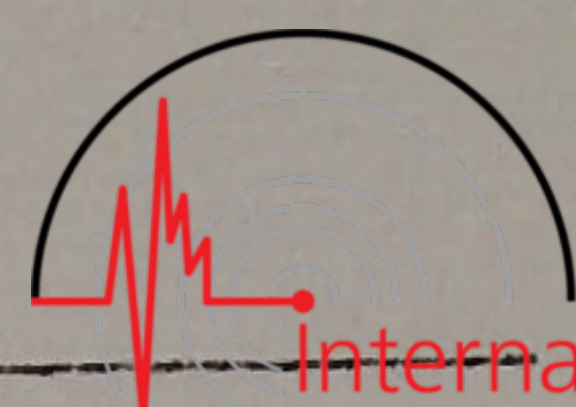
NOTE: Determinations of absolute time are not attempted from the Jaggar records; only the intervals between pulses being measured.

Identification of the various P and S pulses of near earthquakes are not included. As in many cases the P recordings are very small, the first P recorded is not necessarily P_n, or any other particular pulses.

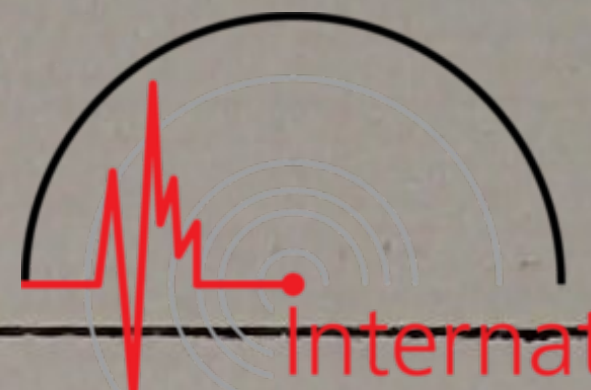
* see also particulars of stations on front and first page.



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS				
June 3	W	P i i i i S i i max	0 04 57		4.4	Felt in Hauraki Peninsula. max R-F 6-7 also felt at Auckland Te Awamutu, Cambridge Tauranga. Epicentre 37.0S, 175.8E				
			05 04½							
								09 15		
								27 32		
								45 51		
								06 01 32		
			N				P i i i S i i i max.	0 04 32	2.5	
								35½		
								41 49		
								58 07		
	05 12 35									
	39 49									
	A	i i i L M			0 04 17			7.0		Absolute time uncertain within a few seconds.
					26 30					
					40 58					
					C						P i i i i i S i i i max.	0 05 32½	7.0
			46 49							
			52 03							
			06 15 30							
			50½							
56 07										
06 32 08										
17										
3	W	P? i S?	0 43 29			Very small. Felt over same area, but feeble. R-F 3 at Waihi & Thames				
			38							
			44 17							
			N		i i i S? i i i		0 43 11			
							15 20			
	29 44									
	48 53									
	58									
	3	W	P i i S i i i L? P i S i i i		01 29 40			Felt over same area; max R-F 5 at Waihi.		
					47					
30 05 29										
33 43										
31 05 01										
01 31 25										
N				P i S i i i	01 29 21	Traces.				
					28 37					
					44 48					
					58 30					
	01 31 26									



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
June 6 (cont.)	C	i i i i?	13 11 25 34 43 12 03			
7	W	P S i	18 26 20 28 30			
12	W		08 58 10			Tremor
14	W		09 22 42			Tremor
14	W	P S	13 25 33 38			Small
15	W		04 47 00			Tremor
15	W	P i iM i i i S? iM i	05 10 47 52 53 59 11 03 05 11 22 43 49 54		ca 0.4	Felt at Peekakariki, R-F 4, & Paraparaumu, R-F 2. Carterton. Epicentre near 41 S 175 E
18	W	P? i S? iM i i i S iM i i i	16 28 39 48 29 14 17 20 16 28 29 33 37 39 43 49 51 56 29 04 10 18		2.3 1.6	very small. Felt at Reefton, R-F 4, and Westport R-F 2. Epicentre approx. 42 S. 172 E
18	H	i iM i	17 (0) (0) 4 11			
20	W		13 38 32			Small, Felt at Waipawa R-F 2.
21	W	P S i	15 46 47 47 07 10		1.6	
	N	iM i i	15 46 41 47 01 13			
23	W	P i S? iM i i i ?	23 15 16 40 42 45 55 16 04 23 15 07 19 22 24 26 32 42		2.2 1.8?	Not recorded at Christ- church, owing to paper being changed.
28	W	i iM i i	05 44 54			Tremor



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
June 29	W	P	16 31 55		1.95	
		i	32 00			
		i	04			
		i	13			
		S	20			
		i	23			
		i	25			
		i	32			
	N	i	43			
		P*?	16 31 53			
		S	32 08			
		i	13			
		i	15			
		i	20			

NOTES:

No earthquakes were recorded during the month at Rotorua, Tuai, Stratford, Bunnythorpe, Takaka, Greymouth, and Monowai. The stations at Kaitaia and East Cape were out of action.

Earthquakes not recorded on any instrument were reported felt during the month as follows:

Waihi and Tairua	3d 07h 15m	R-F 3
Waihi and Whitianga	3 15 30	R-F 3
Whitianga	3 19 30	
Takaka	4 04 50	
Dannevirke	17 14 03	R-F 3
Wainihinihi	17 23 15	R-F 4.
Dannevirke	19 14 08	R-F 2.

In all, twenty earthquakes were reported felt during the month, the greatest intensities recorded in the North Island being R-F 6-7 in the Hauraki Peninsula on June 3rd, and in the South Island, R-F 4 at Reefton.

A special study of the main Hauraki earthquake of June 3rd has been made, and the results will be published separately.

3rd QUAR
1937

Bulletin No 64 1937 July

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

Tables used :—

(1) For normal earthquakes—

(a) Tables, by H. Jeffreys and K. E. Bullen, 1935.

(b) Pasadena Travel-time Curves, by B. Gutenberg and C. F. Richter, 1934.

(2) For deep earthquakes—

(a) Depth, Time, and Distance Chart, by G. J. Brunner.

(b) Tables by K. Wadati and K. Masuda.

Determination of focal depth is made by means of the Brunner Chart ; and by the methods due to K. Wadati (Bull. Eq. Inst., vol. 9, p. 494, 1933) and to R. C. Hayes (Dominion Observatory Bulletin 107).

In these reports, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
Kaitaia ..	36° 6' S	173° 20' E	300	Claystones ..	Mr. C. B. Michie.
East Cape ..	37° 40' S	178° 35' E	(approx.) 505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' E	212	Rhyolite tuffs ..	Powerhouse Superintendent.
Rotorua ..	38° 8' S	176° 15' E	930	Rhyolitic silts and gravels	Mr. Tregear, Government Tourist Bureau.
Tuai ..	38° 48' S	177° 9' E	960	Gravels ..	Resident Electrical Engineer.
New Plymouth ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	Superintendent, the Prison.
Stratford ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Mr. A. W. Burrell.
Hastings ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Mr. H. de Denne.
Bunnythorpe ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Mr. W. A. Waters.
Takaka ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	The Postmaster.
Greymouth ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels.	District Engineer, P.W.D.
Christchurch ..	43° 32' S	172° 37' E	25	Gravels ..	Director, Magnetic Observatory.
Chatham Islands ..	43° 57' S	176° 31' W	210	Volcanic breccia ..	Superintendent, Radio Station.
Monowai ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Mr. W. H. Hutton.

PART I.DISTANT EARTHQUAKES.STATIONS * and INSTRUMENTS:

WELLINGTON: (Dominion Observatory) Central
Station

Acting-Director : R.C. Hayes.
Observer: C.N.M. Watson-Munro.

Milne-Shaw - N-S component.	Pend.period	9.9	sec.
Galitzin-Wilip - Z	"	7.0	"
Galvanometer	"	10.6	"

CHRISTCHURCH: (Magnetic Observatory)

Director: H.F. Skey.

Galitzin - N-S, E-W, and Z component.

ARAPUNI:

Milne - E-W component, Pend. period 24 sec.

CHATHAM ISLANDS:

Milne - NE-SW component, Pend. period 6 sec.

* See also particulars of stations on front page.

WELLINGTON.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
July 1	i eL? M1 M2 M3	13 12 33 31+ 35 39 44	 20 20 20		Tremors on horizontal
2	P pP? PP i PcP S sS i PcS SS? Lq? Lr? M	2 43 00 17 44 05 55 46 35 47 58 48 27 56 50 10 25 40 51 53+	 20	30.5	Focal depth 50 - 100 km.
4	P? pP sP? PP PcP i sPP? sPcP S PcS? sS SS? SSS Lr M1 M2 M3	6 01 45 02 40 03 15 26 53 04 16 58 06 04 07 22 57 08 55 09 47 10 18 11 14 12 17 18	 20 23 18 15 12	39 ca	Small. Focal depth 300 km.ca. Poorly defined May be Lq.
4	P? i PP PPP S? sS? i Lq SS Lr M1 M2	6 45 18 40 46 35 47 06 51 12 52 40 53 35 54 25 55 00 58 56+ 7 01+	 17 23 20 14	41 ca	Small, confused with previous shock. Focal depth 300 km.ca. Interpretation doubtful owing to confusion with tail of previous shock.
4	P? PP? PPP PcP S? sS? SS? SSS? i Lr? M1 M2	7 32 05? 33 05 36 34 22 37 42 39 09 53 40 42 41 12 42 15 43+ 48+	 17 18 13	39ca	Very small and doubtful. Focal depth possibly 300 km ca. Interpretation doubtful owing to confusion with previous movements. May be Lq.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
July 8	eL?	22 54			Traces
10	eL M	21 18 22	17		
11		14 17			Irregular tremors for about 25 mins.
14		23 00			Tremors for about 30 mins.
15		2 40			Tremors.
19	i i eL	03 01 32 07 40 11			
19	P? PP PPP PcP? S SS SSS? L M	9 31 56 32 15 52 35 30 36 47 37 40 38 10 39+ 42	12	28.6	Vertical out of adjustment.
19	i i i Lq?	19 53 25 54 02 20 01 59 09			Vertical out of adjustment.
22	PP? SKS PS PPS i SS SKKS SSS? Lq Lr M1 M2 W2?	17 29 34 30 38+ 39 38 42 55 45+ 50 00 51 17 56 00 18 01 50 04 08 58	28 24 21 17	116 ca	Very small and doubtful. Very long periods.
22	i i i i L M1 M2	19 01 22 04 24 06 31 09 01 18+ 26 32	20 20 18		Confused with tail of previous shock.
25	eL	4 25			
26	P? i PP pPP? PPP? SKS? PS? i SSS Lq? Lr? M	4 00 58 01 17 04 45 05 30 06 05 12 03 14 23 50 21 05 24 32 27 37 34		84 ca	may be sPP. L waves very small with poorly defined maxima. Probably deep focus.
26	eL M	20 36 41	30 22		

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
July 30	P	13 59 17	16	11 ca	Small and doubtful.
	PP	28			
	S?	14 01 23			
	L	03			
	M	30			
	i	04 50			
PcP?	05 09				
30	P	14 05 54	13	11 ca	V Very small and doubtful. Interpretation doubtful owing to confusion with previous shock.
	S?	07 56			
	L	09 45			
	M	10			
	PcP?	11 40			
31	eL	21 16			



ERRATUM to report Bulletin for 1937 June, E 63:

earthquake of 1937 June 14d 12h; time of S should read 39m 24s.

CHRISTCHURCH - Provisional Bulletin.

(as prepared by the Director of the Magnetic Observatory)

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS.
July 1d.	SNE	12.12.17		Z defective.
	SRLE	17.42		
	LqN	24.39		
	LrE	27.12		
2d.	iPNEZ	2.43.20	30.0,	compression, N.N.W., 70/80 km.
	i _r PNZ	35		
	iS	48.17		
	iZ	32		
	isSE	43		
	PcS	49.29		
	Lq	50.04		
	LrZ	52.05		
4d.	ePNEZ	6.02.05	32	compression, N.N.W.
	PRLNZ	03.01		
	PcPNZ	04.24		
	S	07.24		
	PcSE	8.45		
	LqE	9.20		
	LrNZ	11.25		
	iScSNE	12.16		
4d.	iPNZ?	6.45.34	32.4?	on coda of above. conspicuous on N, Az. west of above?
	iSNE	50.56		
	LqE	52.54		
	LrZ	55.11		

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS
July 4d.	ePNZ PR1N PcPN SNE PcS LqNE LrZ	7.33.04 34.12 35.46 38.21 40.18 40.30 42.24	31.7	compression, N.N.W. possibly earlier in hour gap, large on E. large on E, 30 sec. period
13d.	eNZ SEZ?	10.53.56 ca. 54.52 "		phases from near shock.
14d.		23.08 ca.		slight seismic activity.
19d.	PEZ SNZ PcSScP Lq LrZ	2.52.31 3.01.52 07.58 11.21 14.49	71.2	compression. sharp on E. larger on N.
19d.	iPZ iPN iSEN LqE LrNZ	9.31.45 31.47 35.48 36.15 36.56	22.2 22.0	from S? small on Z very large on E. 42m 31s see page 6.
22d.	ePNZ eP'Z ePR1Z iN SKSNE eSN iPSE LqE LrNZ	17.26.30 30 20 30.45 34.47 36.48 38.40 40.17 56.37 18.03.00	108±	Movements from two shocks may be superimposed. large on E. small.
25d.	LqE LrNZ	4.23.56 26.44		earlier phases masked by microseisms.
26d.	ePNEZ iNEZ PR1EZ SKSE iSKKSE iSN PS iPPSEZ SR1 SR2 SR3E LqE LrNEZ	4.00.54 01.06 04.47 11.33 12.21 12.42 14.20 15.08 19.47 23.50 27.30 28.55 34.23	102.5	compression small. Large on E. small.
26d.	PNZ? iSE Lr	8.14.47 26.43 48.50	104.8?	compression.
26d.	PEZ iSKSN SEZ S PSNE iSR1N SR2N LqNE LrNZ	20.09.30 19.38 19.40 20.04 20.54 25.36 29.04 32.00 36.58	85.6	compression.
30d.	P S ScSZ LrEZ	13.57.06 14.04.04 6.42 11.24	47.2	compression. long period. followed by series of short pulses. Movements from two shocks may be superimposed.
31d.	PEZ eSN LqN LrEZ	21.00.23 9.24 16.17 21.33	67.5	compression.

ARAPUNI.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
June 28	eL	23 51.2			
July 2	eL	2 48			
	M	51			
4	eS	6 06.4			
	i	07.9			
	M	09.5			
4	eS	6 51+			
	i	51.8			
	M	53			
4	e	7 38+			
	i	39.2			
	M	40			
19	eL	9 38.4			
	M	41+			
<u>CHATHAM ISLANDS.</u>					
June 21	eL	15 55			

The readings from the following shock were omitted from the CHRISTCHURCH report.

Date	Phase	G.M.T.	Distance in deg.	Remarks.p
July 19	iPZ	19.42.31	90.5	
	eSEZ	53.28		pulsations from near shock 51.08
	PSTZ	54.26		
	SR1E	59.12		
	iNE	20.00.59		
	iNEZ	02.15		
	SR2EZ	3.15		
	LqE	5.05		
	LrNZ	13.12		

PART LI.LOCAL EARTHQUAKES.Index to Stations.*

W - WELLINGTON - Dominion Observatory - Central Station.

Wood-Anderson, N-S, pend. period 0.44 sec
Imamura, three components:-

pend. periods N-S = 6 sec.
E-W = 6 sec.
Z = 4 sec.

Acting Director: R.C.Hayes,
Observer : W.M.Jones.

- A - ARAPUNI - Milne, E-W (see page 1)
B - BUNNYTHORPE - Jaggar, NW-SE.
C- CHRISTCHURCH - Wood-Anderson, N-S pend. period 0.74 sec.
CH - CHATHAM ISLANDS - Milne, NE-SW. (see page 1.)
G - GREYMOUTH- Jaggar, E-W.
H - HASTINGS.- Jaggar NE-SW.
K - KAITAIA - Milne-Shaw, E-W.
M - MONOWAI - Jaggar, E-W.
N - NEW PLYMOUTH -Wood-Anderson, E-W Pend. period 0.78 sec.
R - ROTORUA - Jaggar, E-W.
S - STRATFORD - Jaggar, E-W.
TA - TAKAKA. - Jaggar, E-W.
TU - TUAI - Jaggar, E-W.

NOTE: Determinations of absolute time are not attempted from the Jaggar records; only the intervals between the pulses being measured.

Identifications of the various P and S pulses of near earthquakes are not included. As in many cases the P recordings are very small, the first P recorded is not necessarily P_n, or any other particular pulse.

* See also particulars on stations on front and first pages.

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
July 1	M	i iM	12 14 (0) (4)			Small
2	N		3 07 08			Small
2	W	P i i i i S iM i i i i	3 08 08 13 15 21 32 41 42 45 47 52 57		2.7	Epicentre 40.7 S, near 171.2 E.
	N	P i i i i	3 08 08 12 14 17 20		2.7?	
	C	S? i i i	3 08 51 09 29 40 56			
3	W		7 11 57			Tremor
4	W		3 40 35			Tremor
4	W	P i i i i S i i iM i i iM i i i	8 30 08 09 11 15 22 30 31 34 37 39 48 8 30 (0) 02 03 07 10 11		1.75	
6	N	P S?	9 54 44 55 00		1.1ca	Felt at Taumarunui, R-F 5. Wanganui, Raetihi and Ohakune. (Not recorded at Wellington, owing to failure of light.)
7	W	P i i S iM i i i i	12 50 49 52 57 51 04 07 12 17 20 22 28		1.1	Felt in area between Taumar- unui, Dannevirke, Paraparaumu, and Wanganui. Max. R-F 6 at Palmerston North. Epicentre 40.4 S., 175.6 E.



DATE 1937	STATION	PHASE	G M T h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
July 7	N	i	12 51 01		1.75	
		i	09			
		i	13			
		i	16			
		3	21			
	B	iM	12 50 (0)			
		i	12			
	C	i	20			
		i?	12 51 46			
		3?	52 07			
i		11				
		i	15			
		i	41			
9	W		1 56 54			Trenor
9	W	P	18 04 44½		0.7	
	i	49				
	S	53				
	i	59				
	i	05 04				
	i	07½				
		i	11			
11	W	P	0 25 04		1.2	Felt at Wanganui, R-F 3.
	S	19				
	iM	20				
	i	23				
	i	25				
11	C	i	18 15 11			
	iM	13				
	i	15				
	i	24				
	i	27				
13	T	P	10 52 37½		2.7	R-F 6 at Napier & Hastings, and felt as far as Wairoa, Tumaranui, Wanganui, and Pongaroa. Epicentre 39.40 S 177.25 E.
		i	41½			
		i	44½			
		i	47½			
		i	58½			
		S	53 10½			
		i	15½			
		i	17			
		i	23½			
		i	27½			
		i	31			
		i	41½			
		i	46½			
			54 02			
		A N	i 3?				10 52 50
	P		10 52 35½			
	i		38½			
	i		41			
	i		48½			
	H	S	53 06½			
		i	12½			
		i	19½			
		i	42			
		i	53½			
	B	iM	10 52 (0)			
i		02				
i		06				
i		16				
iM1		10 52 (0)				
	M2	(10)				
	i	(20)				



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.			
July 13	C	P+?	10 53 33						
		i	47						
		i	52						
		i	55						
		i	54 00						
		i	04						
		S	18						
		i	23						
		i	29						
		i	37						
	i	51							
	i	55 21							
	i	41							
	TU	? i S? iM1 iM2 i i	10 52 (0) 05 10 11 17 23 26						
	15	W	P	5 18 27		2.0	Felt at Karamea, R-F 3.		
i			31						
i			36						
S			51						
i			56						
i		19 00							
i		04							
C		i S? i i	5 18 38 53 58 19 12						
16		V	i	6 58 29					
			S	36					
16	V		7 44 05			Tremor.			
18	TA		23 11			Local Tremor.			
19	W	P	19 49 46		2.4	Felt at Dannevirke, R-F 3. Epicentre 41.4 S, 177.9 E. possibly deep focus.			
		i	49						
		i	51						
		i	53						
		i	57						
		i	50 05						
		i	09						
		S	15						
		i	19						
		i	20						
		iM	22						
		i	24						
		i	27						
		i	31						
		i	36						
		i	42						
		N	i i iM i	19 50 51 55 51 05 16					
		H	i iM	19 49 (0) 7					
	11 $\frac{1}{2}$								
	C	i S? i i	19 50 25 51 08 17 41 45						



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
July 19	W		20 26 31			Tremor
21	W	i S	19 41 12 27			Felt at Wanganui, R _z F 3.
24	W	P i i i i S i i i i S?	10 31 25 26 $\frac{1}{2}$ 30 37 48 $\frac{1}{2}$ 55 $\frac{1}{2}$ 56 $\frac{1}{2}$ 59 $\frac{1}{2}$ 32 01 04 10 32 49 56 33 00		2.5	
24	W	P? i i i i i S i	17 11 17 24 27 31 35 37 $\frac{1}{2}$ 39 43		1.7	
24	W	P i i i S i i i i i i i	17 12 16 24 26 $\frac{1}{2}$ 31 38 39 42 44 $\frac{1}{2}$ 50 $\frac{1}{2}$ 57 $\frac{1}{2}$ 17 12 (0) 5 13 23		1.7	Felt at Dannevirke, R-F 1.
27	H	i iM i i	13 02 (0) 2 9 13			Felt at Napier.
28	W		5 52 05			Tremor.
28	W	P i i S? i iM i i i i i P i S? S? i	14 03 01 $\frac{1}{2}$ 03 09 25 30 $\frac{1}{2}$ 33 36 38 42 50 14 02 54 03 01 15 14 04 37 46 05 02		1.9	Felt at Dannevirke & Taihape, R-F 3. Epicentre near 39.75 S, 176 E.
28	W	P i S?	17 29 51 55 30 11			



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
July 28	W		21 05 33			Tremor.
28	C	i i S?	21 19 42 56 20 05			
29	W	P i i i i S i iM M2 i i i i i	05 45 46 47 48 $\frac{1}{2}$ 50 $\frac{1}{2}$ 52 $\frac{1}{2}$ 46 04 08 $\frac{1}{2}$ 11 13 $\frac{1}{2}$ 19 27 30		1.4	Felt at Tanganui R-F 5 and Taihape.
	H N C	i i S?	05 45 (0) out of action. 05 47 04			Traces.
		i i i i i	07 24 32 37 45			
29	W		14 09 04			Tremor
29	W		09 41			Tremor
29	W	P i i S iM	21 38 57 39 00 06 16 22		1.5	
30	W	P i i S?	1 58 08 13 26 33			
30	W	P i i S i i i i i i? i S? i i i i i M1 M2 i i i S i i i	6 49 47 50 02 05 12 $\frac{1}{2}$ 15 16 $\frac{1}{2}$ 19 $\frac{1}{2}$ 21 6 49 59 50 07 17 20 31 37 6 49 (30) 32 34 $\frac{1}{2}$ 37 50 50 04 $\frac{1}{2}$ 14 22 $\frac{1}{2}$ 6 51 19 22 32 36		2.0	Felt at Hastings R-F 5 & Waiz pawa R-F 4. Epicentre near 39.8 S, 176.5 E.
	N					
	H					
	C					



NOTES: No earthquakes were recorded during the month at Rotorua, Stratford, and Greymouth. The stations at Kaitaia and East Cape were out of action.

Earthquakes not recorded on any instrument were reported felt during the month as follows:

Whakatane 18 d 16 h 22 m R-F 3.
Napier 25 12 28 R-F 2.

Fourteen earthquakes were reported felt during the month, the greatest intensity reported in the North Island being R-F 6 at Napier and Hastings, and in the South Island, R-F 3 at Karamea.

PROVISIONAL EPICENTRES IN NEW ZEALAND AND SOUTH WEST PACIFIC; 1937 MAY.

Origin Time (G.M.T.) 1937 d. h. m.	Provisional Epicentre		Focal Depth	REMARKS.
	Lat. (deg.)	Long. (deg.)		
May 10 15 25	27 S	178 E	600 km +	
12 02 45	4 S	144 E	150 km	
19 07 53	41 S	174 E		Felt about Cook Strait. max. R-F 4.
30 16 23	41 S	172½ E		Felt at Nelson & Collingwood, R-F 4.
31 15 32	7 S	156 E	50-100 km.	

ERRATA to Epicentres in Previous Reports:

Bulletin E59, p. 7: epicentre of earthquake of 1937 January
23d 10h 56 should read 6 S, 152 E;
and that of earthquake of 1937 January
25d 06h 34m, should read 11 S, 161 E.
Bulletin E 62, p. 11: epicentre of earthquake of 1937 April
16d 03h 01m should read 20 S, 179 W.

.....00000.....

The Acting-Director of the Dominion Observatory wishes to acknowledge with thanks the following seismological publications which have been received during the month of July 1937:

Sydney	May
Perth	Feb. & Apr. No. 5 & 6.
Melbourne	June
Union G. et G. I.	April.
Pasadena	Local shocks.
Bureau Central	April
Strasbourg	April
Parc St. Maur	April
Chiufeng	May
Manila	June 21
Palau	January - May 12.
Bucarest	May
Adelaide	June
Numada	Vol. VI 1936
Tokyo Research Institute	Part 3 & 4 1936
Hongkong	May
Kew	May
Perth	Jan - Feb. April - May
Manila	June 24
Rathfarnham Castle	May
Phu Lien	December 1936 Preliminary
Trieste	July - September 1936
Ksara	May 1937
Riverview	June
Central station J.S.A.	Preliminary bulls. 10, 11, 12
Schweizerisches Erdbebenbulletin	No. 84. 13.
Stations Teleseismiques de Reseau Seismique de L'USSR.	Nos. 8, 9, 10
	7, 11, 12. 1936
Reseau Seismique Regionale de La Cremee.	Jan.-Dec. 1935. July-Dec. 1934.
Stations " " " l'Asie Centrale	No. 2, 1, 1934 No. 1-4
	3-4. No. 1-4 1935
	No. 1 1936.

.....00000.....



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

Tables used :—

(1) For normal earthquakes—

(a) Tables, by H. Jeffreys and K. E. Bullen, 1935.

(b) Pasadena Travel-time Curves, by B. Gutenberg and C. F. Richter, 1934.

(2) For deep earthquakes—

(a) Depth, Time, and Distance Chart, by G. J. Brunner.

(b) Tables by K. Wadati and K. Masuda.

Determination of focal depth is made by means of the Brunner Chart ; and by the methods due to K. Wadati (Bull.Eq.Inst., vol. 9, p. 494, 1933) and to R. C. Hayes (Dominion Observatory Bulletin 107).

In these reports, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
Kaitaia ..	36° 6' S	173° 20' E	300	Claystones ..	Mr. C. B. Michie.
East Cape ..	37° 40' S	178° 35' E	(approx.) 505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' E	212	Rhyolite tuffs ..	Powerhouse Superintendent.
Rotorua ..	38° 8' S	176° 15' E	930	Rhyolitic silts and gravels	Mr. Tregear, Government Tourist Bureau.
Tuai ..	38° 48' S	177° 9' E	960	Gravels ..	Resident Electrical Engineer.
New Plymouth ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	Superintendent, the Prison.
Stratford ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Mr. A. W. Burrell.
Hastings ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Mr. H. de Denne.
Bunnythorpe ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Mr. W. A. Waters.
Takaka ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	The Postmaster.
Greymouth ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels.	District Engineer, P.W.D.
Christchurch ..	43° 32' S	172° 37' E	25	Gravels ..	Director, Magnetic Observatory.
Chatham Islands ..	43° 57' S	176° 31' W	210	Volcanic breccia ..	Superintendent, Radio Station.
Monowai ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Mr. W. H. Hutton.

PART I.DISTANT EARTHQUAKES.STATIONS[#] AND INSTRUMENTS:

WELLINGTON : (Dominion Observatory) Central
Station

Acting-Director : R.C. Hayes.
Observer : C.N.M. Watson-Munro.

Milne-Shaw - N-S component.	Pend. period	9.9	sec.
Galitzin-Wilip - Z	"	"	" 7.0 "
	Galvanometer	"	10.6 "

CHRISTCHURCH: (Magnetic Observatory)

Director: H.F. Skey.

Galitzin - N-S, E-W, and Z component.

ARAPUNI:

Milne - E-W component, Pend. period 24 sec.

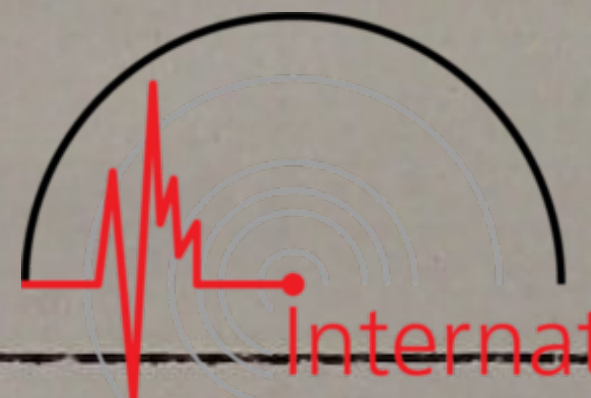
CHATHAM ISLANDS:

Milne- NE-SW component, Pend. period 6 sec.

See also particulars on stations on
front page.

WELLINGTON.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Aug. 1	e	11 24			Irregular tremors for about 30 minutes.
1	e	23 30			L-tremors from distant shock.
2	eL	16 30			Tremors from distant shock.
3	e eL?	3 10 28			Irregular tremors from distant shock.
5	P ipP isP ePP PcP isPP ipPcP PcS S isS? Lq Lr M1 M2	14 51 33 56 52 12 53 15 23 40 57 57 32 46 58 19 15 02+ 04+ 06 09	6 7 30 25 20		Depth 100 km.+
6		5 49			Tremors on strong microseisms.
6		8 46			" " " "
9	eL	08 45			tremors from distant shock.
11	iP i i i iPF PPP iS i iPS iPS i Lr	01 05 20 25 29 31 07 17 08 20 12 55 13 07 21 16 30 17 13 20+			Deep Focus type. May be SS or ScS L-waves, small amplitude.
11	i i	1 34 27 36 48			Apparently a fresh shock superimposed on coda of previous shock.
11	e	10 04 ca.			Tremors.
13	e? eL M	11 54 12 04 13	10		Doubtful Prolonged.
13	i eL	18 33 54 36			
15		1 44			Tremors on strong microseisms
16	e M	10 38 41	15		Confused with microseisms.
18	eL M	5 23 29	12		Tremors from distant shock
20		7 10 ca			Prolonged tremors.



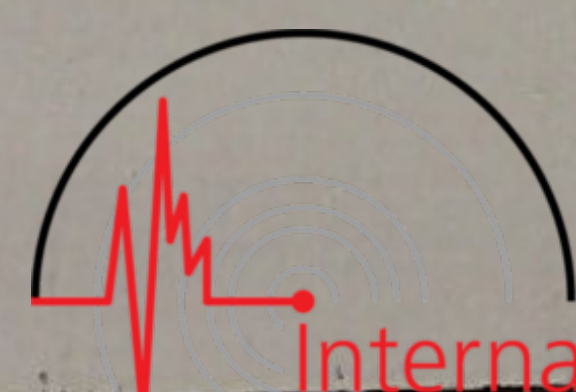
DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Aug. 20	eP iP PcP PcS i S PS SKS ScS? i i i iSS SSS Lq Lr M1 M2 M3 M4	12 10 56 11 02 20 16 10 18 50 20 19 28 21 05 16 22 36 23 10 25 29 25 58 27 35 28 45 30 43 32 33 38 48			Reported destructive in Philippine Islands.
Aug. 22	e eL?	08 14 22			
23	i i S iSS L M	16 42 25 42 46 10 48 08 50 55			
24	P pP PP i PcP? S i sS PcS Lq Lr?	18 33 24 53 34 10 35 48 36 48 38 01 11 57 39 56 40 10 42	12		Depth 150 km. ca. L-waves prolonged. Some of these may be from a more distant shock superimposed upon the above.
30		04 04 ca.			Tremors from distant shock.
31	e eL M	2 40 45 46			Tremors or strong microseisms
			17		

CHRISTCHURCH.

Provisional Bulletin.

(As prepared by the Director, Magnetic Observatory)

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS.
Aug. 1d.	eP?	10.49.34	110±	small in microseisms.
	SKS	11.00.06		
	PPPS	5.38		
	eSRL	9.52		
	Lq	20.34		
	Lr	27.16		



DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS
Aug. 1d.	slight seismic activity 23.24 ca., paper off 23.25.17			
2d.	P?	16.23.56	26.5?	masked by microseisms
	SN	28.35		
	Lq	30.00		
	Lr	31.55		
5d.	iP	14.51.42	41.5	compression
	iPcP	53.42		
	iPcSNE	57.56		
	iS	58.05		
	Lq	15.01.05		surface waves small.
	iScS	01.34		
	Lr	04.05		
9d.	ePZ?	8.35.39	43.3?	
	eS	42.13		
	LqN	45.45		
	LrEZ	48.50		
10d.	LrE	14.19.52		also light seismic activity 18.30 ca.
	LrNZ	22.57		
11d.	iPNEZ	1.05.14	54.8	sharp dilatation, then large compression, Az. N.N.W., 100 km. dilatation
	ipPZ	05.36		
	iPR1	7.12		
	iPR2	8.12		
	iS	12.49		large on E.
	isS	13.29		Surface waves smaller than body ones.
11d.	Lq	10.04.20		
	Lr	08.00		
13d.	eP?	11.54.55	43.5?	
	eS	12.01.30		
	Lq	03.44		
	Lr	06.40		
15d.	slight seismic activity, 1.39 ca.			
16d.	PNZ?	10.31.13	21.9	compression in large microseisms. Large on E.
	SNE	35.13		
	Lr	36.50		
18d.	eEN	5.25.06		followed by small irregular waves.
	eZ	26.18		
20d.	iPZE	6.50.38	81.8	compression, probably deep. largest on N.
	iS	7.00.53		
	SR1	5.57		
	SR2	9.36		
	LqN	12.40		small
	LrEZ	19.58		quite small.
20d.	iP	12.11.00	72.4	compression, z.N.W.
	iP	11.32		larger " "
	iP	13.06		large " "
	iSN	20.28		
	iSEN	34		larger than earlier impulse on N.
	iSZ	20.37		
	S2N?	21.00		
	S2Z?	21.08		records tangled, PS?
	iSR1	25.42		
	iSR2	29.16		
	eLqW-ANE	30.48		(W-A Wood Anderson)
	iLQ	31.38		very large on N, off slit,
	Lr	34.14		42 second period.
	MZ	38.58		
21d.	eP	7.07.52 ⁺		a near shock, times uncertain, contacts giving trouble
	eNE	8.08		largest on N.
	iS	8.38		" " "
	i	8.52		" " "
	i	9.02		very sharp on Z



DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS.
Aug. 22d.	slight seismic activity	8.21 ca.		
23d.	PNZ iNZ S iNZ LqE	16.42.22 42.32 46.36 46.46 47.30		compression 24.5, 40km. Cape sP? sS? Rayleigh waves very small and indefinite.
24d.	iPNZ iPRIZ S PcSZE LqE LrNZ	18.33.51 34.37 38.49 40.26 40.35 42.23	29	small dil. preceding large compression
31d.	PNZ? S eLqE Lr	2.35.10 40.04 42.22 44.47	28.5?	in large microseisms.
31d.	PNZ? S LqE Lr	15.02.59 07.58 10.32 13.04	29.1?	in very large microseisms.
<u>ARAPUNI.</u>				
July 30	e i	14.00.7 08.1		Doubtful
30	i	14 10.5		Apparently from a second shock.
Aug. 5	L M	15 01 ca. 1 04		In time gap
11	i eL?	1 14.0 17.7		
20	e iS SS? Lq Lr M1 M2 M3 M4 M5	12 19.0 20.4 26+ 28.7 30+ 32 34 40 42 44		
24	i e	18 36 + 41.0		Very small & doubtful
31	e	2 41		Tremor
<u>CHATHAM ISLANDS.</u>				
July 19	e	9 39		tremors in microseisms.
30	i	13 59.4		Microseisms strong.
30	i	14 09.7		" "

PART II.LOCAL EARTHQUAKESIndex to Stations:†

W - WELLINGTON - Dominion Observatory - Central Station.

Wood-Anderson, N-S pend. period 0.44 sec.
Imamura, three components:

pend. periods N-S = 6 sec.
E-W = 6 "
Z = 4 "

Acting Director: R.C.Hayes
Observer: W.M.Jones.

- A - ARAPUNI - Milne, E-W (see page 1)
B - BUNNYTHORPE - Jaggard NW-SE.
C - CHRISTCHURCH - Wood-Anderson, N-S pend. period 0.74 sec.
CH - CHATHAM ISLANDS - Milne, NE-SW (see page 1)
G - GREYMOUTH - Jaggard, E-W.
H - HASTINGS - Jaggard, NE-SW.
K - KAITAIA - Milne-Shaw, E-W.
M - MONOWAI - Jaggard, E-W.
N - NEW PLYMOUTH - Wood-Anderson, E-W, pend. period 0.78 sec.
R - ROTORUA - Jaggard, N-S.
S - STRATFORD - Jaggard, E-W.
TA - TAKAKA - Imamura strong-motion; three components,
Pend. periods:
N-S = 6 sec.
E-W = 6 sec.
Z = 2.5 sec.
TU - TUAI - Jaggard, E-W.

NOTE: Determinations of absolute time are not attempted from the Jaggard records; only the intervals between the pulses being measured.

Identifications of the various P and S pulses of near earthquakes are not included. As in many cases the P recordings are very small, and first P recorded is not necessarily P_n, or any other particular pulse. Unless otherwise indicated, times recorded refer to the incidence of the impulsive movements.

† See also particulars of stations on front and first pages.



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Aug. 1	TU	i iM	11(0) (0) 11			
2	W		12 50 07			Tremor
2	W	P	20 12 52 54 $\frac{1}{2}$ 56		1.8	R-F 4 at Kahurangi Point Epicentre 41.2 S; 172.3 E.
		S	13 15 17 21			
		M	23 $\frac{1}{2}$ 26			
	N	Sq?	20 13 37 44 47 51			
			14 02 15			
	C	P	20 13 03 06 08 13 22 28		2.5	
		S	33 38 43			
12	W	eP	10 55 48 56		4.4	R-F 5 at Hicks Bay Epicentre 37 $\frac{3}{4}$ S; 178° E.
			56 00 $\frac{1}{2}$ 05 $\frac{1}{2}$ 12			
		S	39 $\frac{1}{2}$ 43 $\frac{1}{2}$ 49 $\frac{1}{2}$ 57			
			57 02 14			
	TU		10 55 (0) 14			
		M	18			
	N	P	10 55 33 37 $\frac{1}{2}$ 41 $\frac{1}{2}$ 50 $\frac{1}{2}$		3.3	
			56 00 $\frac{1}{2}$ 09 $\frac{1}{2}$ 14			
		S	19 $\frac{1}{2}$ 27 $\frac{1}{2}$ 30 $\frac{1}{2}$ 35 $\frac{1}{2}$ 40 $\frac{1}{2}$			
			44			
	C	P+?	10 56 50 57 02			
		S	46 50			
		M	54 58			
			58 04 15 20 28			



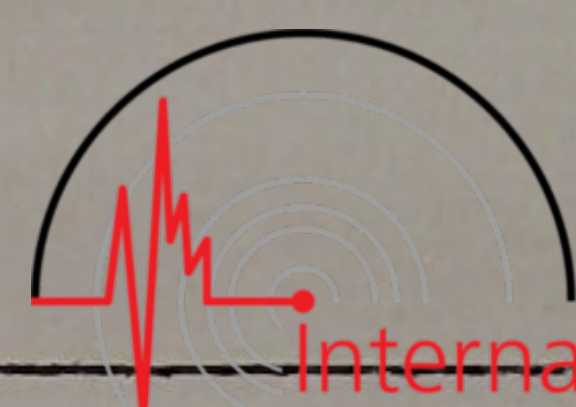
DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Aug. 12	W	S	20 55 06			Probably aftershock of above.
	N		20 54 47			
13	W	P ⁺	07 42 15 $\frac{1}{2}$		2.0	Felt between Kawhia, New Plymouth, Wanganui and Taumarunui. max. R-F 4. Epicentre near 39 $\frac{1}{4}$ S; 175E.
		S ⁺	20 40 45 $\frac{1}{2}$			
	N	P	07 41 51 $\frac{1}{2}$		0.7	
		S	42 00 27			
	C	S ⁺ ?	07 43 43			
14	H	M	01(22)(0) 11 28			
14	W		04 09 47			
14	W	P	12 23 44		4.8	Epicentre 38 S, 179 E.
		S	24 42 44			
		M	46 53			
	N	P	12 23 34		4.0	
		S	24 21 28			
	C	P _q ? S	12 24 32 25 45			
15	C	M	18 34 59 35 01			Local
16	C	M	00 04 01 07 11 12 14 $\frac{1}{2}$ 18 33 $\frac{1}{2}$			Local
16	C		00 06 19 25 29 30 33 37 53			Local, cf. previous shock.
18	W	P ⁺	01 25 20		0.7ca.	Epicentre near 41.4 S.; 173.8E
		S ⁺ M	21 22 $\frac{1}{2}$ 28 30 32 34 45			
	N	S?	01 26 12 20 30 36			



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS
Aug. 18 (cont.)	C		01 26 41 45 53 11 36 51			
18	TU	M	23(11)(0) 4			
21	W	eP S	07 08 30 09 29 56 10 02 16 29 39 55			Felt at Queenstown, R-F 4?
	N	L eP	07 08 38 09 41 50 10 07 24 49 11 01 31			
	C	L? P	07 07 57 08 02 08 20 26 35 38 42 49 53 09 02			
21	W	Pg S+? M	09 18 49 51 54 ^{1/2} 57 ^{1/2} 58 ^{1/2} 19 05 08 13 ^{1/2}		0.5?	Felt Wellington, R-F 2.
	C	P S? S?	09 19 06 18 21 25 31 46 51=			
22	W	P S	00 02 21 27 ^{1/2} 56 59 ^{1/2} 03 00 ^{1/2} 03 05		2.7	Epicentre near 39 S, 176 ^{1/4} E.
	N C	P S S? M	00 02 09 34 00 03 51 59 04 01 03		1.8	



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Aug. 23	W		00 13 22			Tremor
24	N		20 48 16 21 27			
25	W	e s	17 57 11 26			Felt at Dannevirke, R-F 4.
27	W		18 20 04			Tremor
28	W		16 40 21			Tremor
28	W		17 37 43			Tremor
30	W	eP s	09 25 37 45 26 00 05 09		1.9	Felt on Asbestos Claim, Upper Takaka.
30	N		18 51 36			Felt at New Plymouth R-F 3.
30	W	P S M1 M2	21 45 35 39 41 $\frac{1}{2}$ 44 50 $\frac{1}{2}$ 57 58 46 01 06 08 13 $\frac{1}{2}$ 17 20 25		1.8	Felt on Asbestos Claim, Upper Takaka, R-F 4. Epicentre 41.2 S, 172.3 E.
	N	? S M1	21 45 48 46 14 16 22 25			
	C	M2 i S M	21 45 30 52 46 09 22 57			
30	W	P S	21 58 49 53 59 05 11 15 $\frac{1}{2}$ 18		1.8	Felt on Asbestos Claim, Upper Takaka, Epicentre 41.2 S., 172.3 E.
	N	? S	21 58 02 07 21 59 28 30 38 45			
	C	S?	21 59 23 31 $\frac{1}{2}$ 52 $\frac{1}{2}$			



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.	
Aug. 30	W	P	22 11 04		1.8	Felt on Asbestos Claim, Upper Takaka. Epicentre 41.2 S, 172.3 E.	
			09				
		S	26				
		M	28				
			30				
			33				
	N	S		22 11 44			
				46			
				54			
	C	S		12 59			
				22 11 39			
				49 $\frac{1}{2}$			
				53			
31	W	P	01 23 25		1.8	Epicentre 41.2 S, 172.3 E. Felt on Asbestos Claim, Upper Takaka.	
				29 $\frac{1}{2}$			
				32			
				34			
				47			
				49			
	N	P? S		24 04			
				01 23 39			
				24 05			
	C	?		01 24 04			
				11 $\frac{1}{2}$			
				15 $\frac{1}{2}$			
				22 $\frac{1}{2}$			
31	W		03 24 27			Tremor	
				34 $\frac{1}{2}$			

NOTES: No earthquakes were recorded during the month at :-
Bunnythorpe, Takaka, Greymouth, and Monowai. Records from Rotorua and
Stratford are not yet available. Kaitaia and East Cape were out of
action.

An earthquake not recorded on any instrument was reported felt
on August 1d 11h 18m at Tolago Bay and Motu, R-F 3.

In all 13 earthquakes were reported felt during the month, the
greatest intensity in the North Island being R-F 5 at Hicks Bay, and
in the South Island, R-F 4 at Kahurangi Point.

PROVISIONAL EPICENTRES IN NEW ZEALAND AND SOUTH-WEST
PACIFIC : 1937 JUNE.



Origin Time (G.M.T.)			Provisional Epicentre		Focal Depth	REMARKS.
1937	d	h m	Lat.(deg)	Long. (Deg.)		
June	3	00 04	37.0 S	175.8 E	Normal	Felt in Hauraki Peninsula, max. R-F 6-7
	6	13 10	37.8 S	178.6 E		
	14	12 30	20 S	169 E		
	14	13 10	20 S	169 E		
	15	05 10	41 S	175 E		Felt in southern part North Island, R-F 4.
	18	16 28	42 S	172 E		Felt Westport & Reefton, max. R-F 4.
	19	17 07	26 S	178 E	600 - 700 km.	

.....00000.....

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS
Sept. 3d.	P S LqE LrNZ	21.47.41 52.15 53.27 55.23	25.9	In microseisms.
4d.	iPZ iS LrNZ	6.20.22 24.24 26.46	22.1	compression, times doubtful. large on N. Lq indefinite.
8d.	iP ipPZ iNZ iZ iS iss iN iEZ	00.51.58 52.27 53.01 55.00 01.01.48 2.41 3.31 3.38	79	large compression, small on E. Az. S.S.E., 125 km. deep. large on E.
15d.	iP ipPNZ iNZ iNEZ iS isSE LqEN LrNZ	12.34.14 34.38 35.17 35.48 39.46 40.27 42.01 44.16	35.5	very large compression, Az. N.N.W. 100 km. deep. Times doubtful, some eclipses failed. very sharp on E. larger on E, 40 sec. period. Lr phases not very large, though V2 phases seem to show during failure of minute eclipses.
15d.	LqN? LrEZ	19.58.50 20.06.45		small, period 62 seconds. " but persist for over 30 minutes.
16d.	PZ? iNE iNEZ SR1 SR2 LqN Lr	0.04.48 13.22 16.16 22.02 26.06 [±] 31.00 36.40		doubtful, compression, in 10 times doubtful, /sec. mic'sms. S?; small on N / some eclipses / failed. 50 sec. period 28 " "
17d.	ipPNZ iSE LqE Lr	9.42.47 52.47 4.22 10.50	78.7	times uncertain, small com- then large dil-/pression, 30 sec. period, /itation.
20d.		7.48 ca.		a few surface waves.
21d.	iP iS iScSE SR1E Lq PcSScPZ Lr	9.49.59 58.18 59.57 10.02.27 5.20 5.37 8.29	60	compression, Az. N.W.
23d.	ePNEZ iP iS	13.13.32 13.36 19.46	40	rarefaction. " Az. N.E.
24d.	eLq? Lr	5.29.45 36.30		In strong microseisms. Renewed activity 6.06 ca.
24 and 25d.				slight seismic activity, 17.10 ca. and 3.43 ca. respectively.
25d.	LqN LrEZ	18.06.50 9.47		

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS.
Sept. 27d.	iP	9.05.43	63.2±	very small compression, Az. NW.
	iP	44		very large dilatation, Az. W.N.W.
	ipPZ?	06.03		
	iPRIZE	8.06		
	iS	14.21		
	iPS	14.51		
	iZ	15.12		
	Sr1	18.34		
	LqN	22.00		
LrEZ	25.28		P and Lr about same amplitudes on Z.	
27d.	PZ?	11.21.33	64.2?	
	S	30.16		
	LqN	38.54		
	Lr	42.30		
27d.	PNZ	23.23.02	29.0	large on E.
	S	28.00		
	LNZ	31.11		
28d.	eP?	6.00.46	29.7?	small, doubtful.
	S?	05.49		
	LqE	7.25		
	Lr	9.27		
29d.	eP	22.07.53	64.7	in microseisms.
	eS	16.40		
	Sr1	21.02		
	LqE	23.40		
	LrNZ	27.14		
30d.	P	4.40.36	22.1	papers just on.
	S	44.38		
	LqE	44.53		
	LrNZ	47.14		
30d.	eP?NZ	12.57.15	30.1?	very small.
	SE	2.21		
	LqE	3.42		
	LrNZ	5.43		

ARAPUNI.

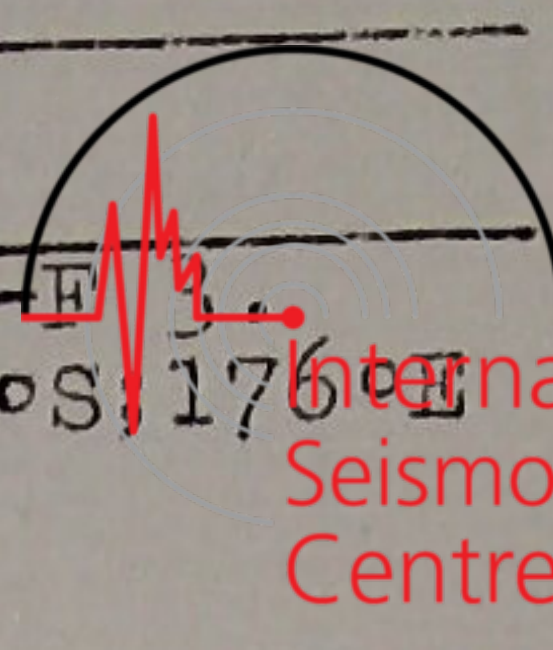
DATE	PHASE	G.M.T.	PERIOD	Δ	REMARKS.
1937		h. m. s.	sec.	deg.	
Sept. 1	e	6 33 ca			See local Register.
3	eS?	19 11.7			
	e	18.6			
	eLr?	25.2			
	M	31			
4	eS?	6 23.1			
	M	24			
8	eS	1 02.9			
	eL	15			
	M	23			
15	iS	12 39.7			
	L	43			
	M	44			
21	e	10 06			
	M	16			
21		10 20			Renewed tremors from near shock; see local register.

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Sept. 23	i iS iLq M i M	13 13.7 19.3 22.3 24 26.8 27+			
27	i eLr i M	9 24.6 26.4 27.8 33			
30	e? M iScSP? M	21 40 43 53.0 54			Beginning doubtful.



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Period sec.	Δ deg.	REMARKS.	
Sept. 1	W	eP	8 41 03		9.4	Felt Raoul Island, Kermadec Is., R-F 3. Approximate epicentre given by U.S.C. & G.S. as 31°S. 179°W.	
			18				
			29				
			35				
			42 49				
	N	eS	42 49		8.1?		
		iM	54				
			43 09				
			28				
			44 05				
	C	S?	8 40 54		12.0?		
			41 04				
			37				
			42 20				
			37				
	H	e?	45				
			8 41 42				
			46				
			42 04				
			30				
		S	43 55				
			44 09				
			16				
			29				
		e	8 40 (30)				
	M1	54					
	M2	41 07					
		18					
		34					
		43					
		56					
1	W	S	15 15 30			Felt at Dannevirke, R-F 4.	
			37				
			40				
			45				
1	W	eP	21 43 33		9.3	Epicentre near that of above at 8h 41m.	
		eS	45 17				
			19 $\frac{1}{2}$				
			21 $\frac{1}{4}$				
			32				
	N	M	36				
			39				
			54				
			21 43 25				
			34				
	C		44 07				
			52				
			45 07				
			16				
			i	21 45 05			
			S	46 17 $\frac{1}{2}$			
				23			
		29 $\frac{1}{2}$					
		38					

DATE 1937	STATION	PHASE	GMT h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Sept. 2	W	P	16 01 02		2.5	Felt Dannevirke, R-F 3. Epicentre near 39°S, 176°E
			04			
			11			
			32			
			34			
	N	P	16 00 48		1.5	
			51			
			54			
	C	S?	01 07			
			10			
			27			
			33			
			39			
3	W	M	19 01 14			
			26			
			39			
3	W	eP	21 49 21		cf. shock of Sept. 1.	
			31			
		S	51 01			
			06			
			12			
			22			
			40			
53 05						
4	W	P	0 54 07		6.0	Probably from ca 150 km NE of East Cape.
			12			
			20 ¹ / ₂			
			55 16			
			20			
			24 ¹ / ₂			
			30			
			49			
			56 03			
	N	P	0 54 00			
			55 01			
			0 56 24			
	C	S M	26			
			37			
			42			
4	W	eP?	9 08 05		1.8+ Felt Taumarunui, R-F 3.	
			09			
		S	26 ¹ / ₂			
			28			
			31			
		N	P	9 07 45		
				52		
				55		
				58		



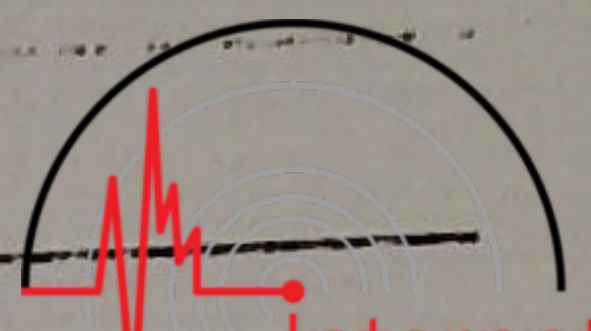
International
Seismological
Centre



International
Seismological
Centre

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS
Sept. 6	C	M	16 53 58 59 54 03 07 16			
8	V		5 13 39			Tremor
9	W	P S	5 49 53 50 15 18 21 24 26 43		1.8	Probably Mt. Domett area; cf. shocks of August 30th.
	N	S?	05 50 33			Small.
11	W		20 04 53			Tremor
13	V	P	5 44 40 47		2.1	
		S? M	45 05 ¹ / ₂ 07 ¹ / ₂ 10 13 20			
	C	P?	5 44 33 36 42 48 ¹ / ₂		1.6	
		S M	52 54 59 45 07 22			
13	N	P M	13 42 31 34			Felt at New Plymouth, R-F 3.
17	V		21 04 27			Tremor
18	W	P M	18 26 37 44			
18	W		18 33 09			Tremor
19	W		13 00 34			Tremor
19	V	P M	22 40 24 33			
21	W	e	10 19 34 44 54 57			Felt Raoul Island, Kerme- decs, R-F 4.
	C	?	20 03 10 20 41 52 59 21 07 10 17 ¹ / ₂			
21	V	P M	19 02 17 25 28 31			
	C	S?	19 03 00			
22	V		10 34 40			Tremor
23	V	P S	6 29 36 51 53		1.3	
			30 07 11			
	N	M	6 30 01 05 07 18			

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS
Sept. 25	V C	P	15 07 28 15 07 04			Traces for 2 mins. Record too faint for de- tails.
26	W	P M	02 52 37 45			
26	W	P	08 07 27 30 37 42 44 46 55		1.2	
	N	P	08 08 06 08 07 26 27 $\frac{1}{2}$ 30 32 35 41 56		1.2	for shock 26d.17h. see bottom of page.
	C	S	08 06 $\frac{1}{2}$ 15 08 08 21			Traces.
27	W		23 31 22			
28	C		05 20 33			
28	W	P	10 30 35 36 $\frac{1}{2}$ 38 40 $\frac{1}{2}$ 44 $\frac{1}{2}$ 54 $\frac{1}{2}$ 56		1.55	Epicentre 41.2 S, 172.7E
	N	? S	31 00 03 07 $\frac{1}{2}$ 15 22 $\frac{1}{2}$ 10 30 53 31 05 17 22 $\frac{1}{2}$ 33 35 49 53 58		2.4	
	C	P? S	10 30 46 54 31 08 11 18 $\frac{1}{2}$ 21 24 29		2.3	
28	H		22 43			Felt at Hastings, R-F 3.
30	W		3 41 23			
30	W	eP S	9 41 51 42 08 13			Felt at Asbestos, Upper Takaka, R-F 4.
Sept. 26	W	? S M	17 09 31 36 37 $\frac{1}{2}$ 40 46			
	N	M	17 09 26			



NOTES: No earthquakes were recorded during the month at TUAI, STRATFORD, BUNNYTHORPE, TAKAKA, GREYMOUTH, MONOVAI. KAITAIA and EAST CAPE were out of action.



Earthquakes not recorded on any instrument were reported felt at:

Taumarunui	September 2d 10h 30m ca.	
Dannevirke	2 16 03	R-F 2.
Taumarunui	4 09 23	R-F 2
Waiotapu	6 02 35	R-F 3
Wairoa	30 23 10	R-F 3

In all ten earthquakes were reported as felt in the North Island, maximum intensity R-F 4 at Dannevirke and one reported in the South Island at Asbestos Claim, Upper Takaka, R-F 4.

In addition, two shocks were reported felt at Raoul Island, Kermedecs, Max. R-F 4.

PROVISIONAL EPICENTRES IN NEW ZEALAND AND SOUTH-WEST PACIFIC: 1937 JULY.

ORIGIN TIME (G.M.T.)	PROVISIONAL EPICENTRE				FOCAL DEPTH	REMARKS.
	1937	d. h. m.	Lat. (deg.)	Long. (Deg.)		
July	2 02 37	14 S	166 E	50-100 km.		
	2 03 08	40.7 S	171.2 E	below normal	Shocks were reported felt at Ugi, Solomon Islands, about this time; R-F 2.	
	4 05 55	7 S	160 E	below normal		
	4 06 38	7 S	160 E	below normal		
	4 07 25	7 S	160 E	below normal	The epicentres are not well defined by the preliminary data available.	
	7 12 50	40.4 S	175.6 E		Felt in southern part of North Island, N.Z. R-F 6	
	13 10 52	39.4 S	177.25 E		Felt in North Island: R-F 6 in parts of Hawke's Bay.	
	19 09 26	60 S	143 E	possibly below normal	Felt at Dannevirke, R-F 3.	
	19 19 49	41.4 S	177.9 E			
	28 14 03	39.75 S	176 E		Felt at Dannevirke & Taihape R-F 3.	
	30 06 49	39.8 S	176.5 E		Felt at Hastings & Waipawa max. R-F 5.	

The Director of the Dominion Observatory, Wellington, wishes to acknowledge with thanks the following ~~Observatories~~ for their seismological publications, which were received during the month of September:

	{ February, April.
St. Louis	{ January, December, 1936, March, 1937
Jesuit Seismological Association	July 26
Florissant	February, January, March
Little Rock	January - February
Hong Kong	July 1937 Preliminary: July
Jesuit Seismological Association	July 22, 19. August 20
Manila	June, July, (Special) July 26 (Pre.) August 20 (Pre.) July
Perth	May to July.
Melbourne	August, Provisional
Riverview	August.
Tananarive	January to February
Bureau Central	June
Strasbourg	June
Parc St. Maur	June
Union G. et G. Int.	June
Rathfarnham	June
Kew	July
Ottawa	June
Adelaide	August.
La Plata	April, May, June.
Zi-Ka-Wei	Preliminary
Ksara	July
Pennsylvania	January $\frac{1}{2}$ June
Pasadena	Local Shocks for June; March.
U.S.C. & G.S.	January; March, 1936.
Phu Lien	April, January, Preliminary June, July.
Union G. et G. Int.	Bibliographique 1, 2, 3.
Denver	January to December, 1936.
Schweizerisches Erdbebenbulletin	No. 86.

The Director of the Christchurch Magnetic Observatory acknowledges with thanks the receipt of the following seismological publications:

- Riverview. May-Aug. 1937.
- J.S.A. Central Station, Prel. Bull. pp. 6-18.
- Sydney. Apr. - July, 1937.
- Budapest, C.I. Rapports 1932, 1936. Erdbebenkatalog 1932-1936.
- De Bilt. 1934 No. 108
- Weston, Mass. Jan-Feb., 1937.
- Apia. No. 2, 1937
- Batavia. pp. 43 - 52, 1936.
- Melbourne. bulletin 38.
- Oxford. I.S.S.
- Pasadena, Jan-Feb. 1937.
- Florissant 1936, pp. 23-26, 1937, pp. 1-9.
- St. Louis " " 47-49, 1937 pp. 1-8.
- Jeffreys. Table for the Near Earthquake Pulses.
- Little Rock. 1936 pp. 18 - 19, 1937 pp. 1-6.
- Pennsylvania. Report III, 1937, Jan. - June 1937.



The Acting Director of the Dominion Observatory
acknowledge with thanks the following publications received
during the month of August, 1937:

Manila	May: Special Bulletin for June
Pasadena	Local Shocks, April.
Schweizerisches Erdbebenbulletin 85.	
Parc St. Maur	May
Strasbourg	May
Bureau Central	May
Union Geodesique et Geophysique Int.	May.
Hong Kong	June, preliminary.
Uccle	January - March.
Batavia	October - December 1936.
Bucarest	June.
Chiufeng	June
Adelaide	July, preliminary
Melbourne	July "
Hong Kong	June
Riverview	July
Melbourne	April June 1937.
U.S.C. & G.S.	July 19.
Pasadena	January - February.
Kew	June.
Manila	July 22, 19, 26.
Tananarive	October - December, 1936.
Columbo	Report for 1935.
U.S.C. & G.S.	Oct. - Dec. 1935.
Ksara	June
Bulgarie	January - June.
St. Louis	November - December 1936.
Florissant	December, 1936.
J.S.A.	Preliminary June 24, July 11.
Hamburg	1937 May, February - April.
Taihoku	May - June.
Sydney	June - July
Parc St. Maur	May
Strasbourg	May
Bureau Central	May
Union Geodesique et Geophysique Int.	May
Hong Kong	June, preliminary.
Uccle	January - March.
Batavia	October - December 1936.
Bucarest	June.
Chiufeng	June
Adelaide	July, preliminary
Melbourne	July "
Hong Kong	June
Riverview	July
Melbourne	April June 1937.
U.S.C. & G.S.	July 19.
Pasadena	January - February.
Kew	June.
Manila	July 22, 19, 26.
Tananarive	October - December, 1936.
Columbo	Report for 1935.
U.S.C. & G.S.	Oct. - Dec. 1935.
Ksara	June
Bulgarie	January - June.
St. Louis	November - December 1936.
Florissant	December, 1936.
J.S.A.	Preliminary June 24, July 11.
Hamburg	1937 May, February - April.
Taihoku	May - June.
Sydney	June - July

4th QUAR
1937

[S.I.R.—20.]



DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

Bulletin E67 1937 Oct

SEISMOLOGICAL REPORT FROM NEW ZEALAND STATIONS.

The report is divided into two parts:—

Part I gives readings of distant earthquakes ($\Delta > 10^\circ$ ca.); and Part II gives readings of local earthquakes ($\Delta < 10^\circ$ ca.). In both parts, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket. Whenever they are definitely indicated, the trace amplitude and the direction of the vertical component of P are given. An upward ground movement is designated (+), and a downward movement (-).

In Part II determinations of absolute time are not attempted from Jaggar records, only the intervals between pulses being measured. In many cases the P movements are very small, and the first movement recorded is not necessarily Pn, or any other particular pulse.

Unless otherwise indicated, times recorded refer to the incidence of impulsive movements.

A list of provisional epicentres in New Zealand and the South-west Pacific is appended. The New Zealand epicentres are determined from the records of local stations, and the more distant ones with the assistance of data from Manila, Hong-Kong, Apia, Riverview, Sydney, Melbourne, and Adelaide. In the determination of South-west Pacific epicentres outside New Zealand, the travel-time tables of Wadati and Masuda are employed.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station Name and Abbreviation.	Position.		Height above M.S.L.	Lithologic Foundation.	Seismographs.	Observers.
	Latitude.	Longitude.				
Wellington (W) ..	41° 17' S	174° 46' E	Feet. 401	Greywacke	Milne-Shaw (N-S)* .. Galitzin-Wilip (Z)* .. Wood-Anderson (N-S)* .. Imamura (three components)* ..	Dominion Observatory, Central Station. Observers— C. N. M. Watson-Munro. W. M. Jones. Acting-Director— R. C. Hayes.
Kaitaia (K) ..	36° 6' S	173° 20' E	300	Claystones	Milne-Shaw (E-W)* ..	Mr. C. B. Michie.
Arapuni (A) ..	38° 5' S	175° 39' E	212	Rhyolite tuffs	Milne (E-W)* ..	Powerhouse Superintendent.
Rotorua (R) ..	38° 8' S	176° 15' E	930	Rhyolitic silts and gravels	Jaggar (E-W) ..	District Engineer, P.W. Dept.
Tuairua (TU) ..	38° 48' S	177° 9' E	960	Gravels	Jaggar (E-W) ..	Resident Electrical Engineer.
New Plymouth (N) ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	Wood-Anderson (E-W)* ..	Superintendent, the Prison.
Stratford (S) ..	39° 21' S	174° 17' E	1,000	Water-sorted volcanic debris	Jaggar (E-W) ..	Mr. A. W. Burrell.
Hastings (H) ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Jaggar (NE-SW) ..	Mr. H. de Denne.
Bunnythorpe (B) ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Jaggar (NW-SE) ..	Mr. W. A. Waters.
Takaka (TA) ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	Imamura (three components)* ..	The Postmaster.
Greymouth (G) ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels	Jaggar (E-W) ..	District Engineer, P.W. Dept.
Christchurch (C) ..	43° 32' S	172° 37' E	25	Gravels	Galitzin (three components) Wood-Anderson (N-S)* ..	Magnetic Observatory. Director—H. F. Skey.
Monowai (M) ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Jaggar (E-W) ..	Mr. A. Walker.
Chatham Islands (CH)	43° 57' S	176° 31' W	210	Volcanic breccia ..	Milne (E-W)* ..	Superintendent, Radio Station.

* Constants are given at the head of station registers.

Part I - Distant Earthquakes.

WELLINGTON.



Instrument constants:

Milne-Shaw (N-S) pend. period = 10.8 sec. damping 20:1; Magnification 250.
 Galitzin-Wilip (Z) " " = 7.0 " "
 galvanometer " = 10.6 " "

DATE	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
1937 Oct. 1	P PP PPP PcP? S L M	14 53 18 54 01 37 55 56 58 16 15 00 35 04	14	30 ca.	Very small and indefinite. The records of this and the two following shocks are superimposed and the interpretations are doubtful
1	P i e s? iLq iLr M	19 21 19 22 24 49 25 03 26 20 27 43 29	16 17 16	20 ca.	Very small and indefinite Poorly defined Prolonged movements.
1	eP? e iLr M	19 39 11 42 14 45 14 46			Confused with previous shock Movements continued till 21h43m ca.
2	eL	2 41			Traces.
2	eL	6 00			Traces.
3	i L	3 38 33 40			Confused with microseisms.
4	e i M	7 49 23 51 35 52	16		Record confused with very strong microseisms.
4	e	17 57			Traces, confused with microseisms.
6	e	10 34			Traces, confused with microseisms.
6	eP iPcP PP i iPPP i iS i i iSS Lq iLr M1 M2	17 10 58 12 20 49 13 31 14 00 17 00 18 26 20 46 21 39 22 05 24 53 27 53 32 35	18 14 13	53 ca.	Very small on Z.
7	iP? e L	8 03 13 25 30			Az. = +1.5 mm. Small and irregular movements,
8		7 50			Traces, confused with microseisms.
9	iP PP eS iLr M	18 01 00ca 41 05 55 07 45 11	12ca.	29ca.	In time gap. Az. = - 1 mm. ca.
10	e	10 50			Traces.
10	eL	20 02			
10	eL	20 30			renewed movements of small amplitude.

DATE	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
193'					
Oct. 11	e	17 44			Traces
11	e eL M	21 43 20 54 35 56	23		Series of regular waves until 22h 23m ca. Maximum poorly defined.
12	iP iPP iS iSS L M iPcS?	3 15 17 44 19 27 20 04 21 00 22 36 23 16	11ca.	24ca.	Az. = + 1 mm.
12	i i	21 04 35 16 15			Irregular movements. Az. = * 1mm.
17	iP iPP eSKS? eSS eLr M	4 59 24 5 02 32 09 41 15 26 30 29	28 25		Maximum not well defined.
18		8 09			Irregular tremors.
19		18 35			Irregular tremors.
20	i eL M	7 43 27 45 20 46	12		
20	eL	20 51			Tremors
22	e	0 58			Traces
22		16 57			Tremors in strong microseisms.
23		4 32			See local register.
23		16 54			See local register.
25		10 34			
26	eL	0 04	24		
27	eL	4 22			
27	i i	11 46 45 47 21			
27	e	19 25			Tremors.
28	e	9 52			Tremors
28	e	16 07			Tremors
29	e L M	19 26 35 28 12 32	10		

CHRISTCHURCH

Provisional Readings.

(as prepared by the Director, Magnetic
Observatory)

DATE	PHASE	G.M.T. h. m. s.	DISTANCE IN DEGREES	REMARKS.
Oct. 1d	PNZ SE ePcPNZ LqE LrNZ PcS ScSEZ	14.53.44 57.37 .43 58.07 59 16 15.00.55 05.40	21.1	from N. Larger on E.

DATE	PHASE	G.M.T. h. m. s	DISTANCE IN DEGREES	REMARKS.
Oct. 1d.	PNZ SNE PcPN LqE Lr PcS ScS	19.21.31 25.20 25.37 25.52 27.07 29.29 33.38	20.6	from N.
1d.	A similar shock may be superimposed from 19.36.20 ca.			
2d.	P? S? Lq LrZ	2.36.00 39.52 40.33 41.56	21.0?	
2d.		4.12ca.		slight seismic activity.
3d.		3.38ca.		" " " in microseisms
4d.	PE? iSZ Lr	7.40.36 46.22 50.52	35.9?	may be large microseisms. do. do.
6d.		10.34ca.		slight seismic activity.
6d.	P PR1 PR2 S SR1? LqN LrZ	17.11.20 13.02 13.48 18.26 21.30 22.02 25.46	48.5	
7d.	PE? SN Lr	8.21.49 26.52 30.20	29.7?	in microseisms.
9d.	PNZ S PcP LqN Lr	18.00.34 3.39 4.48 5.06 6.19	22.5	from N.
11d.	PZE SN Lr	21.46.24 51.18 54.12	28.5	
12d.	iP eSEZ iPcP LqE LrZ	3.14.51 18.34 18.46 18.56 20.22	20.0	comp. N.N.V.
12d.		6.43 ca.		slight seismic activity.
12d.		21.15ca.		" " "
17d.	ePZ iNZ ePR1NZ eSEN iNEZ SR1 Lq Lr	4.57.33 59.30 5.00.51 08.03 09.36 15.07 22.20 26.03		Microseisms? Small. P? very small. S?
18d.	ePNZ? SE eLq Lr	8.01.50 07.03 09.09 11.00	31.1	in microseisms.
20d.	e iZ iE eN	7.41.35 42.22 42.25 42.25		Too near for teleseismic recorders to show phases clearly. followed by irregular waves.
20d.	e Lr	20.41.42 51.28		



DATE	PHASE	G.M.T. h. m. s.	DISTANCE IN DEGREES+	REMARKS.
Oct. 23d	e iZ iN iEZ	16.55.03 55.19 56.17 56.22		Rather larger than similar shock on 20d. (See Local Register) Followed by large irregular waves.
24d		12.28 ca.		Slight seismic activity mainly on N component.
25d	P? S LqN ScSE Lr	7.33.45 39.48 42.34 43.16 44.40	38.3?	(See Local Register)
25d	e i i	10.35.04 35.54 36.19		Followed by large irregular waves.
26d		0.04 ca.		Seismic activity.
27d		3.19 ca.		" "
27d		11.47 ca.		" "
28d		9.51 ca.		" "
28d		16.03 ca.		" "
29d	PZ? S LqN Lr	19.15.02 21.03 23.50 26.00	38.0?	

ARAPUNI.

Constants of Milne Seismograph (E-W): pend. period = 24 sec.
(Undamped); Magnification = 5.6

DATE	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
1937 Oct. 1	e M i	19 24.0 25.5 26.8			
23		16 53.8			See local register.
25		10 33.9			" " " "

CHATHAM ISLANDS.

Constants of Milne Seis. (NE-SW) - Pend. period = 15 secs. (Undamped); Mag. = 6

Aug. 20	e eLq	12 22.7 33.5			
24	e eS i	18 38.0 43.7 44.3			
Oct. 12	eS?	3 23.7			Tremors for about 5 minutes; faint record.
23	e	16 55.9			See local register.
25	e	10 36.6			See local register.

Part II - Local Earthquakes.

Instrument constants:

Wellington: Wood-Anderson Short-period seismograph N-S component,
Pendulum period = 0.44 secs.

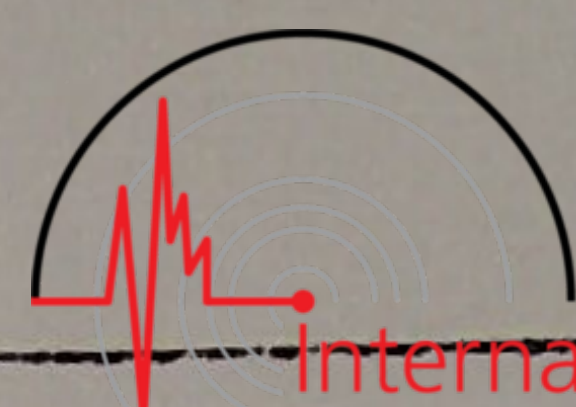
Imamura Strong-motion Seismograph, three components,
Pendulum periods N & S " = 6 sec.
Z " = 4 sec.

Christchurch: Wood-Anderson Short-period seismograph N-S component,
Pendulum period = 0.74 secs.

New Plymouth: Wood-Anderson Short-period seismograph, E-W component,
Pendulum period = 0.78 secs.

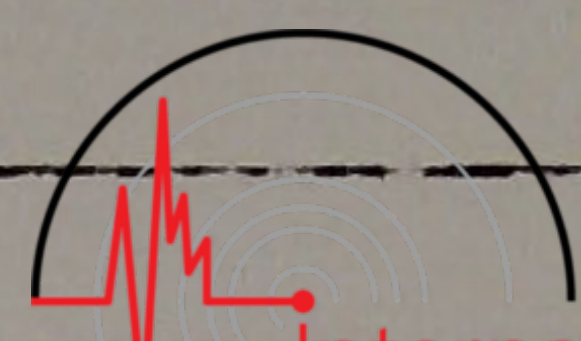
Takaka: Imamura Strong-motion seismograph, three components,
Pendulum periods, N & S components = 6 secs.
Z component = 2.5 secs.

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS
Oct. 1	W	P	14 34 07	1.9	Epicentre near 42.3 S, 172.6 E.
			09 $\frac{1}{2}$		
		13			
		20			
		30			
	N	S	32		
			36		
			38 $\frac{1}{2}$		
	C	P?	14 34 42	1.4	
			14 34 33		
52					
55					
35 05					
1	N	M	35 07	.	
			20		
			14 33 58		
			44 15		
			19		
2	W	P*	21 00 29	1.1	Felt Wanganui, R-F45, Marton 4, New Plymouth and Paraparaumu. Epicentre near 40.2 S; 175.2 E.
			40		
			44		
			47		
			53		
	N	S	17 24 11	1.4	
			13		
			15		
			19		
			24		
C	P	25 $\frac{1}{2}$	1.4		
		28			
		31			
		37			
		53			
3	W	e	17 24 19	1.4	commencement of small motion.
			22		
3	W	S	17 24 22 $\frac{1}{2}$	1.4	Tremor
			37 $\frac{1}{2}$		
3	W	S	25 16	.	Small
			17 25 05		
3	W	S	16 35 17	.	Small
			23 49 13		
3	W	S	25 16	.	Small
			26		



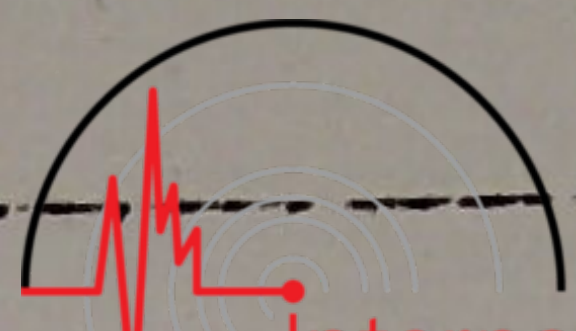
DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Oct. 4	W	P	2 08 44 $\frac{1}{2}$ 46 $\frac{1}{2}$ 53 $\frac{1}{2}$ 54 $\frac{1}{2}$ 56 58 09 03		
4	W		4 15 50		Tremor
6	W		19 32 33 40 42		Small
9	W	S P M	14 29 27 33		
11	W		11 07 03 07 10		
11	W	P	15 52 28 31 $\frac{1}{2}$ 35 38 44 $\frac{1}{2}$ 49 $\frac{1}{2}$ 51 $\frac{1}{2}$ 53 56 53 00 05 07 $\frac{1}{2}$	1.9	Felt at Kahurangi Point, R-F 6, Collingwood, R-F 4, and Nelson. Epicentre 41.2 S; 172.2 E.
	N	e S M	15 52 50 53 01 09 13 18 $\frac{1}{2}$ 27 $\frac{1}{2}$ 34 41 57	2.6	
	C	P?	15 54 15 52 34 38 43 46 58	2.4	
		S	53 02 11 22 37		
12	W	P	2 16 45 49 51 $\frac{1}{2}$ 58 $\frac{1}{2}$	1.7	Felt at Takaka, Collingwood R-F 3, and Asbestos R-F 4. Epicentre 40.8 S; 172.7 E.
		S	17 06 07 $\frac{1}{2}$ 11 12 14 17 21		
	N	e S? M	2 16 56 17 15 20 $\frac{1}{2}$ 24 27 32 34 40 53	2.0	

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS																								
Oct. 12 (cont.)	C	?	2 17 06		very small.																								
12	W	P	8 40 22	2.3	Felt Napier, R-F 3, and Waipawa. Epicentre 39.6 S, 176.7 E.																								
			27 $\frac{1}{2}$																										
			35																										
			38 $\frac{1}{2}$																										
		S	44 $\frac{1}{2}$																										
			50 $\frac{1}{2}$																										
			52																										
			53 $\frac{1}{2}$																										
			55 $\frac{1}{2}$																										
			59																										
	N	P	41 10	2.1																									
			8 40 19 $\frac{1}{2}$																										
			31 $\frac{1}{2}$																										
		S	35																										
			46																										
			49 $\frac{1}{2}$																										
			59 $\frac{1}{2}$																										
			41 07																										
	H	P	8 40 (0)																										
			3																										
		M1	5 $\frac{1}{2}$																										
		M2	11 $\frac{1}{2}$																										
			17																										
			21																										
			35																										
	C		8 41 55		Very small.																								
13	W		15 01 07		Tremor																								
13	W	P	21 05 08	2.5	Small, Felt at Napier, R-F 3.																								
		S	38																										
13	W	P?	22 54 06	1.2+	<table border="1"> <tr> <td>Oct. 13</td> <td>H</td> <td>P</td> <td>21 05 (0)</td> </tr> <tr> <td></td> <td></td> <td>M1</td> <td>4$\frac{1}{2}$</td> </tr> <tr> <td></td> <td></td> <td></td> <td>14</td> </tr> <tr> <td></td> <td></td> <td>M2</td> <td>17$\frac{1}{2}$</td> </tr> <tr> <td></td> <td></td> <td></td> <td>32</td> </tr> <tr> <td></td> <td></td> <td></td> <td>38</td> </tr> </table>	Oct. 13	H	P	21 05 (0)			M1	4 $\frac{1}{2}$				14			M2	17 $\frac{1}{2}$				32				38
Oct. 13	H	P	21 05 (0)																										
		M1	4 $\frac{1}{2}$																										
			14																										
		M2	17 $\frac{1}{2}$																										
			32																										
			38																										
			11																										
		S	21																										
		M	23																										
			26																										
			28																										
	N	M	22 54 26																										
			33																										
			37																										
15	W	P	16 22 21																										
			23																										
		M	25																										
15	C	P	19 28 55																										
		M	57																										
			29 05																										
			08																										
			12																										
			14																										
			17																										
18	W	e	16 18 21		Very small																								
		S	55																										
20	W		4 16 03		Very small																								
			06																										
			15 $\frac{1}{2}$																										
20	W	e	10 54 50 $\frac{1}{2}$		P's small.																								
			57 $\frac{1}{2}$																										
		S	55 04																										
			06																										
			08																										
			10																										
			12 $\frac{1}{2}$																										
			20																										
21	W	P	5 50 18																										
			22																										
		M	23																										
			25																										

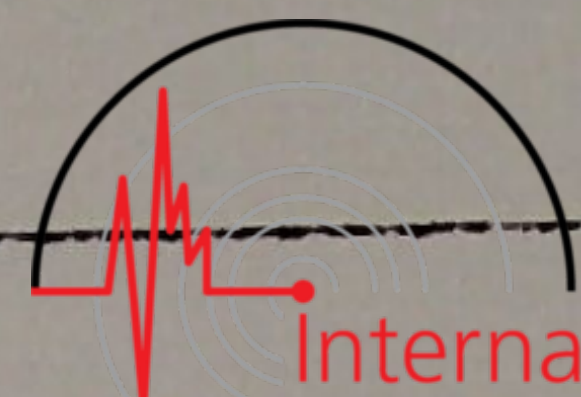




DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Oct. 22	W		0 59 09		Traces.
22	W	eP	8 42 54 43 09 $\frac{1}{2}$ 11 15		
23	W	M e M	0 07 22 29		
23	W	P	1 54 03 04 05 $\frac{1}{2}$ 08 $\frac{1}{2}$ 14 16 $\frac{1}{2}$ 19 $\frac{1}{2}$ 23 $\frac{1}{2}$ 26 $\frac{1}{2}$ 29 36 $\frac{1}{2}$	0.8ca.	Felt Havelock R-F 4. Wellington and Blenheim. Epicentre near 41°S, 173 $\frac{3}{4}$ °E.
	N	P	1 54 24 30 39 44 48 $\frac{1}{2}$ 53 55 06 13 $\frac{1}{2}$ 16 31 41	1.9	
	C	P	1 54 35 $\frac{1}{2}$ 38 43 49 53 55 02 04 $\frac{1}{2}$ 07 $\frac{1}{2}$ 10 $\frac{1}{2}$ 17 $\frac{1}{2}$ 20 $\frac{1}{2}$ 29	2.7ca.	
		M(S?)			
23	W	e	2 46 40 45 48		
23	W	M P	15 20 05 07 09 17 $\frac{1}{2}$ 20 22 $\frac{1}{2}$ 28 33 $\frac{1}{2}$	1.1	Felt at Wellington, R-F 2.
	N	? S?	15 20 18 30 40 48 51		

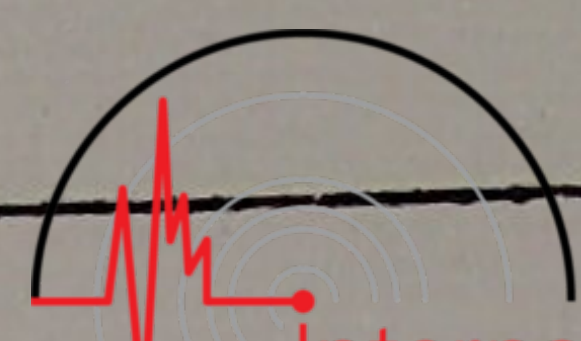


DATE	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
1937 Oct. 23	W	P	16 54 24½	4.1	Felt in Raukumara Peninsula. Max. R-F 5-6 at Opotiki, westward to Puke, and southward to Wairoa. Provisional epicentre 37.9 S, 177.8 E.
			29		
			33½		
			38½		
			40½		
			49½		
			53		
		S	55 13½		
			15½		
		M	17		
			25½		
			40½		
	A	P	16 53 50		A few seconds uncertainty in clock correction.
			54 01		
		S?	08		
			17		
			34		
	TU		16 53 (0)		
		M	16		
	N	P	16 54 11	3.2?	
			17½		
			20		
			23½		
			30½		
			35		
			45½		
		S?	53		
	H	P	16 54 (0)		
			4		
			10		
		M1	12		
			13½		
			20		
		M2	22		
		M3	30½		
			38½		
			48		
	C	P?	16 55 03		
			19		
			25		
			33		
			51		
			56 13		
			18		
		S	22		
			33		
			43		
	CH	e	16 55.9		
		is?	56.7		
		i	58.2		
		M1	17 00		
		M2	02		



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.		
Oct. 25	W	P	10 34 28 $\frac{1}{2}$	4.1	Felt in Raukumara Peninsula. Opotiki R-F 6, westward to Tauranga and southward to Wairoa. Provisional epicentre as above 37.9 S; 177.8 E.		
			30 $\frac{1}{2}$				
			32 $\frac{1}{2}$				
			39				
			44				
		S	50				
			35 17 $\frac{1}{2}$				
			19 $\frac{1}{2}$				
			21 $\frac{1}{2}$				
			26				
	A	P	36 08	3.2	A few seconds uncertainty in clock corrections.		
			10 33 53				
		S	34 01				
			12				
			23				
	TU	P	40				
			51				
	N	M	10 34 (0)			3.2	Large movements, further phases not recognisable.
			11				
		M2	18				
			36				
		P	35 09				
			10 34 14 $\frac{1}{2}$				
			20 $\frac{1}{2}$				
			23				
			30 $\frac{1}{2}$				
			33 $\frac{1}{2}$				
	H	S?	38	3.2	Large movements, further phases not recognisable.		
			48 $\frac{1}{2}$				
		P	56				
			10 34 (0)				
		M	2				
10							
17							
21							
27							
35							
CH	eS?	39	3.2	Large movements, further phases not recognisable.			
		35 12					
		20					
		29					
		10 36.6					
C	e	37.0	3.2	Large movements, further phases not recognisable.			
		37.5					
		39.0					
		40.7					
		41.9					
	M2	43					
		10 35 04					
		10					
		17 $\frac{1}{2}$					
		28 $\frac{1}{2}$					
C	e	39	3.2	Large movements, further phases not recognisable.			
		45					
		49					
		54					
		36 01 $\frac{1}{2}$					
		20					
54							

Time-marking gap from 32sec. to 44 sec; S probably missed.



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.	
Oct. 25	W	eP	10 45 05 18 36		Aftershock of above. Felt at Opotiki R-F 4, Whakatane and Motu.	
		S	55 58 46 05 42			
	TU	M?	10 45 (0) 16 $\frac{1}{2}$ 22			
	N		10 44 56 $\frac{1}{2}$ 45 02 08 15 19 $\frac{1}{2}$ 30 38 45			
25	W	eP	10 54 45			Smaller aftershock of above. Felt Whakatane and Motu, R-F 2.
		S	55 27 31			
	TU	M	10 54 (0)			
	N		10 54 33			
28	W	e	20 41 26			
		S	38			
30	W	e	04 55 01			
		S	14			
30	W	i	12 57 54		Tremor.	
31	W	S?	2 23 33		Very small	
			51			
	C	P	2 21 51			
			22 03			
			10 $\frac{1}{2}$ 22 $\frac{1}{2}$			
		S?	39 48 50			
			23 00 20			
31	W	eP	2 42 35	1.8		Felt Taumarunui R-F 4. Wanganui, Raetihi and Taihape.
			39 43 46			
			49 $\frac{1}{2}$ 53 $\frac{1}{2}$ 56 $\frac{1}{2}$ 59 $\frac{1}{2}$			
		S	43 01 $\frac{1}{2}$ 07 13 $\frac{1}{2}$ 21 $\frac{1}{2}$ 31 34 37 $\frac{1}{2}$			
	C		2 43 03			
					Small movements.	

NOTES:

No earthquakes were recorded during the month at Rotorua, Stratford, Bunnythorpe, Takaka, Greymouth and Monowai. Kaitaia was out of action.



Earthquakes not recorded on any instrument were reported felt at:-

Rotorua, October 19d 18h 30m. R-F 5.
Wainihinihi, " 26 22 R-F 4.

In all eleven earthquakes were reported felt in the North Island, maximum intensity R-F 6 at Opotiki, and four in the South Island, maximum intensity R-F 6 at Kahurangi Point.

PROVISIONAL EPICENTRES IN NEWZEALAND AND SOUTH-WEST PACIFIC: 1937 AUGUST.

ORIGIN TIME (G.M.T.)	PROVISIONAL EPICENTRE		Focal Depth	REMARKS.
	Lat. (deg.)	Long. (deg.)		
1937 d. h. m.				
Aug. 2 20 12	41.2 S	172.3 E	150 km.ca	Felt Kahurangi Point, R-F4.
5 14 43	6 S	146 E		
12 10 55	37.75 S	178 E		Felt Hicks Bay, R-F.5.
13 07 42	39.25 S	175 E		Felt western parts of North Island, R-F 4.
14 12 23	38 S	179 E		
18 01 25	41.4 S	173.8 E		
22 00 02	39 S	176.25 E		
30 21 45	41.2 S=	172.3 E		Felt Upper Takaka, R-F 4.
30 21 58	41.2 S	172.3 E		" " "
30 22 11	41.2 S	172.3 E		" " "
31 01 23	41.2 S	172.3 E		" " "
31 02 28	14 S	166 E		

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

Bulletin E 68 1937 Nov

SEISMOLOGICAL REPORT FROM NEW ZEALAND STATIONS.

The report is divided into two parts:—

Part I gives readings of distant earthquakes ($\Delta > 10^\circ$ ca.); and Part II gives readings of local earthquakes ($\Delta < 10^\circ$ ca.). In both parts, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket. Whenever they are definitely indicated, the trace amplitude and the direction of the vertical component of P are given. An upward ground movement is designated (+), and a downward movement (-).

In Part II determinations of absolute time are not attempted from Jaggar records, only the intervals between pulses being measured. In many cases the P movements are very small, and the first movement recorded is not necessarily Pn, or any other particular pulse.

Unless otherwise indicated, times recorded refer to the incidence of impulsive movements.

A list of provisional epicentres in New Zealand and the South-west Pacific is appended. The New Zealand epicentres are determined from the records of local stations, and the more distant ones with the assistance of data from Manila, Hong-Kong, Apia, Riverview, Sydney, Melbourne, and Adelaide. In the determination of South-west Pacific epicentres outside New Zealand, the travel-time tables of Wadati and Masuda are employed.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station Name and Abbreviation.	Position.		Height above M.S.L.	Lithologic Foundation.	Seismographs.	Observers.
	Latitude.	Longitude.				
Wellington (W) ..	41° 17' S	174° 46' E	Feet. 401	Greywacke	Milne-Shaw (N-S)* .. Galitzin-Wilip (Z)* .. Wood-Anderson (N-S)* .. Imamura (three components)* ..	Dominion Observatory, Central Station. Observers— C. N. M. Watson-Munro. W. M. Jones. Acting-Director— R. C. Hayes.
* Kaitaia (K) ..	36° 6' S	173° 20' E	300	Claystones	Milne-Shaw (E-W)* ..	Mr. C. B. Michie.
Arapuni (A) ..	38° 5' S	175° 39' E	212	Rhyolite tuffs	Milne (E-W)* ..	Powerhouse Superintendent.
Rotorua (R) ..	38° 8' S	176° 15' E	930	Rhyolitic silts and gravels	Jaggar (E-W) ..	District Engineer, P.W. Dept.
Tuai (TU) ..	38° 48' S	177° 9' E	960	Gravels	Jaggar (E-W) ..	Resident Electrical Engineer.
New Plymouth (N) ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	Wood-Anderson (E-W)* ..	Superintendent, the Prison.
Stratford (S) ..	39° 21' S	174° 17' E	1,000	Water - sorted volcanic debris	Jaggar (E-W) ..	Mr. A. W. Burrell.
Hastings (H) ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Jaggar (NE-SW) ..	Mr. H. de Denne.
Bunnythorpe (B) ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Jaggar (NW-SE) ..	Mr. W. A. Waters.
Takaka (TA) ..	40° 51' S	172° 48' E	25	Alluvial gravels ..	Imamura (three components)* ..	The Postmaster.
Greymouth (G) ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels	Jaggar (E-W) ..	District Engineer, P.W. Dept.
Christchurch (C) ..	43° 32' S	172° 37' E	25	Gravels	Galitzin (three components) Wood-Anderson (N-S)* ..	Magnetic Observatory. Director—H. F. Skey.
Monowai (M) ..	45° 47' S	167° 37' E	538	Tertiary sandstone ..	Jaggar (E-W) ..	Mr. A. Walker.
Chatham Islands (CH)	43° 57' S	176° 31' W	210	Volcanic breccia ..	Milne (E-W)* ..	Superintendent, Radio Station.

* Constants are given at the head of station registers.

Part I - Distant Earthquakes.

WELLINGTON.



Instrument Constants:

Milne-Shaw (N-S) pend. period = 10.8 sec. damping 20:1;
Magnification 250.
Galitzin-Wilip (Z) " " = 7.0 sec.
Galvanometer " " = 10.6 sec.

DATE	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS
1937 Nov. 2	e eL M	11 02 ca. 14 18	20		
2	e	15 23 ca			Irregular tremors
4	e	22 54			tremors
5	e eL	9 43 ca. 56			Tremors
7	eL	10 05			" .Also tremors at 11h 03m
8	e	5 59			"
8	e	7 47			"
8	e	15 54			"
9	eL	10 16			"
10	e	8 09			"
12	e	23 03			"
13	eL	6 11			"
13		9 53 09		9	See local register.
13		17 56 26		9.4	" " "
14	eP? eS? eLq Lr M	5 52+ 56 02 59 6 01 01 30		22ca.	
14	iP ipP iPP iPPP i Lq i	11 16 42 18 25 19 22 21 02 22 02 35 39		70±	Focal depth 450 - 500 km? Interpretation doubtful; possibly a complex shock. Large
14	eS? eL M	20 43 07 45 47			
15		2 18			See local register.
15	e Lq M	6 33+ 38+ 41			
15	eL	22 37			
16	i Lr M1 M2	15 58 16 16 00 29 03 07	12		
17	i Lr M	2 54 55 58+ 3 00			
18	iS? L M1 M2	2 10 08 13 14 16	10		
20	e M	20 31 37			Surface Waves.
22		5 18			Slight tremors
23	i eL M	14 09 50 14 17	20		

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Nov. 24	eL	2 08			Tremors
25	iS?	4 46 45			In strong microseisms.
	eL	49 42			
	M	50			
27	i	8 16 06			
	eL	18 50			
	M	19			
27	e	10 59 36			
	eL	11 03			
27	e	13 52+			
	e	54 40			
27	e	14 14			
	S?	22 47			
	eL?	33 20			
27	e	17 19			
	M	23			
28	eL	00 12			Tremors
28	e	5 46			"
29	e	3 11			"
29		11 21			"
29	eL	21 50			"
30	e	1 04			
	eL	21			
30	e	14 01			Surface waves.



International
Seismological
Centre

CHRISTCHURCH.

(Provisional Readings)

Nov. 2	P	11 01 36		53.2	Az. S.S.W.? in microseisms.
	iPRiNZ	3 37			
	S	9 11			
	SS	12 50			
	LqE	13 40			
	LrNZ	17 40			
2	P	15 20 42		18.1	
	S	24 08			
	LqN	24 23			
	LrEZ	25 50			
	ScSNZ	32 49			
5	PZ	9 43 47		52.7	In microseisms.
	S	51 19			
	LqE	55 38			
	eLrNZ	59 54			
7	ePEZ	9 00 59		17.7	In microseisms.
	SNZ	10 04 22			
	LqN	4 36			
	LrEZ	6 04			
	PcSEZ	9 20			
7	PZ?	10 59 00		17.2	In strong microseisms.
	S	11 02 18			
	eLqN	02 30			
	Lr	03 46			
	PcSEZ	06 50			
7	LqNE	16 51 35			In strong microseisms.
	LrZ	52 48			

DATE	PHASE	G.M.T.	PERIOD	Δ	REMARKS.
1937		h. m. s.	sec.	deg.	
Nov. 8	ePNZ SE eLqE Lr	5 54 06 57 34 48 59 34		18.3	
8	eP S eLqN PcSE eLrZ	15 43 20 48 22 49 19 34 51 38		29.6	
9	PZ SNZ LqN LrZ	11 09 47 14 51 15 48 17 20		29.9	
10	ePEZ eSNZ LqN eLrZ	7 49 43 58 54 8 06 18 11 20		69.2	compression
12	eP SN LqN Lr	22 59 07 23 02 28 46 04 19		17.5	
13	eP SN eLqN Lr ScSNZ	6 05 57 09 21 45 11 24 18 15		17.9	
13	iE iZ eNE eE eS iZ iNE eE iNE i iNZ iNZ iZ iN i w2EN w2Z	9 54 12 55 30 55 30 55 35 55 56 57 05 22 30 58 00 33 10 00 22 01 50 04 26 05 24 09 00 12 26 ca. 27 ca.	20 30		may be a large microseism. a sharp compression (See also local register) emerging from earlier phase. short period, on Wood-Anderson. large but complicated. impulses on 30 sec. wave. becomes maximum on N. Large and isolated on Z becoming max. amp.
13	eSNEZ eNE iE iNZ iEZ iEZ	17 59 18 40 18 00 36 01 22 02 54 06 52	20 30 20		Short period, shows on Wood-Anderson small, pulsations superimposed. Large. (See also Local register.)
14	LqE Lr	5 58 36 6 01 10			
14	iPZ ipPZ PP iEZ SN iNEZ SS LqE iN	11 16 42 18 18 19 14 21 54 25 50 29 07 30 22 35 00 39 08	40 20	70 [±]	Deep. isolated wave.
14		20 45 30 ca.			a few surface waves.
15		2 18			See local register.
15	PNZ S LqE LrNZ	6 33 20 37 40 38 26 40 02		24.1	small compression from N.



DATE	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS
1937					
Nov. 15		22 48 ca.			slight seismic activity
16	ePZ eLr	15 40 37 16 00 52		64±	very small
18	P PcSNZ SEZ LqE Lr	2 56 13 3 02 10 40 5 47 9 28		42.2	compression.
18		16 25 ca.			seismic activity, in microseisms.
20	ePNZ? iPNZ eSE eLqE LrNZ	20 25 57 59 29 07 31 30 28		16.2	from S; dilatation, ?; compression from N.
22	LqN LrEZ	5 15 47 17 27			in microseisms.
23		8 18			See local register.
23	PZ iS Lq Lr	14 02 49 8 23 10 29 13 17		34.1	compression.
24	eP S eLqE LrNZ	2 03 05 06 31 07 03 08 27		18.1	
25	PNZ SEZ Lq SSZ Lr ScS	4 42 48 47 58 49 20 44 51 26 52 52		30.7	compression. small on N. larger on E.
26	eE eNE LqE? eZ	11 09 46 19 54 23 54 28 14	20 40 20		small movement in microseisms small small.
27	eP eS Lq iPcPNZ Lr iPcSN iScSEZ	8 14 38 18 01 18 41 20 03 15 22 51 27 38		17.7	larger on E.
27	eP eS LqE eLr	10 59 20 11 02 43 03 06 04 30		17.7	
27	PEZ SNE eNE eNZ	13 44 51 54 41 14 05 00 14 40	40 20	76.6	a conspicuous phase on E. small "
27	PNZ eLq LrNZ	17 17 09 21 44 23 30			larger on E.
28	P PcP SN PcSN Lq ScSZ Lr	00 04 51 7 16 10 23 11 21 12 52 15 15 16 37		33.9	surface waves very small.





DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS
Nov. 28	iPEZ PPZ iS SS LrEZ	5 36 08 39 07 46 05 51 19 6 01 35		78.2	compression, became largest phase on Z. very small
29	P SEZ PcSNE LqE LrNZ	3 06 41 12 00 13 16 33 15 35		32	compression
29	P S LqE PcPNE LrNZ PcSEZ	5 29 49 33 11 37 57 35 10 38 08		17.7	compression sharp on N. small. sharp on Z, emergent on E.
29	PEZ SNZ iN eLqN eLrEZ ScSNZ MEZ	11 09 47 15 06 16 15 39 19 13 20 12 21 52	9	32	compression. PcS?, deep? very small " " Larger than Lq or Lr.
29	iP S LqE iPcPZ LrNZ iPcSE iScSEZ	21 44 33 48 09 37 53 50 11 52 45 56 24	30	19.2	compression, small. small, largest on E. conspicuous
30	PEZ iSN SS LqN LrEZ	00 53 27 03 52 9 36 16 08 21 44		83.8	compression small on EZ.
30	PEZ SN PS eSS LqN eLr	13 23 47 35 13 36 23 41 54 50 19 56 54	40	97	compression

ARAPUNI.

Constants of Milne Seismograph (E-W): pend. period = 24 sec.
(Undamped); Magnification = 5.6

Nov. 13		9 52			See local register.
13		17 57			" " "
14		11 36			Tremors
23	e	14 13			"
25	iS?	4 46.5			"
27		8 51.6			"

CHATHAM ISLANDS.

Constants of Milne Seis. (NE-SW) - Pend. period = 15 sec. (Undamped); Mag. = 6

Nov. 7		10 09			Irregular tremors in heavy micro-seisms.
--------	--	-------	--	--	--

Part II - Local Earthquakes.

Instrument constants:

WELLINGTON: Wood-Anderson Short-period seismograph N-S component,
pendulum period = 0.44 secs.

Imamura Strong-motion Seismograph, three components
pendulum periods N & S " = 6 sec.
" " Z " = 4 "

CHRISTCHURCH: Wood-Anderson Short-period seismograph N-S component,
pendulum period = 0.74 sec.

NEW PLYMOUTH: Wood-Anderson Short-period seismograph, E-W component,
pendulum period = 0.78 sec.

TAKAKA: Imamura Strong-motion seismograph, three components,
pendulum periods, N&S components = 6 sec.
Z " = 2.5"

DATE	STATION	PHASE	G.M.T. h.m. s.	Δ deg.	REMARKS
1937 Nov. 4	W	eP	2 26 39 42 45 58 27 00 04 06 08	1.5	P's very small.
4	W	eP	5 45 21 26 36 38 $\frac{1}{2}$ 41	1.1 ca	P's very small.
		S(M)			
	N	P	5 45 (0)		Time uncertain, owing to clock stoppage
	C	S?	5 46 15 $\frac{1}{2}$ 17 $\frac{1}{2}$ 18 $\frac{1}{2}$		
8	W	P	11 29 42 49 53 55 $\frac{1}{2}$	0.9	
		S			
		M			
9	W	P	1 37 52 57 $\frac{1}{2}$ 38 08 21 $\frac{1}{2}$ 24 26 29 34	2.3	
		S			
		M			
		C	1 39 10		small motion
9	W		9 43 49		tremor
11	H		13 23 (0)		Small motion for 1 min. ca.
11	W	e	22 24 11		
		S?	17		

DATE	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
1937 Nov. 12	W	eP P*	5 16 59 17 02 06	3.2	Felt at Greymouth, R-F 3, Hokitika, and Wainihinihi. Epicentre near 42.8 S, 171.0 E.
		e	10 14 16 $\frac{1}{2}$		
		S	32 36 44 49		
	N C	P*	5 17+ 5 16 32 $\frac{1}{2}$	1.4	Fogged, no details readable.
		S*	37 45 51 17 01 06 16 19 28 37		
13	W	eP	9 53 09	9ca.	
		S	22 36 54 50 52 55 $\frac{1}{2}$ 59 55 01 04 13 48		On Galitzin. " "
	A	L M ?	09 57 43 52 42 53 01		
		S? L S?	48 54 20 9 53 (35) 59 54 10 15 55 01		A few seconds uncertainty in absolute time
	C	S?	9 55 55 58 56 05 11		
13	W	e S	10 04 19 41		Superimposed on surface waves of pre- vious shock; probably an aftershock. Traces.
13	C W	eP	10 05 54		
		S	17 56 26 51 57 05 58 11 13 14 $\frac{1}{2}$ 16 19 21 $\frac{1}{2}$	9.4	
	A C	L S?	17 57 40 17 59 18 21 27 34		
14	W	eS?	00 48 28		small.

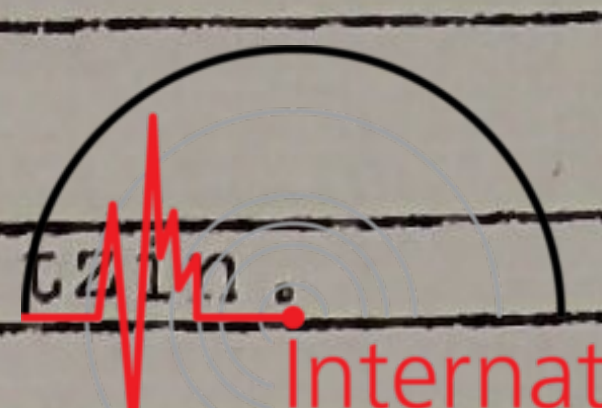
DATE	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS
1937 Nov. 14	W	eP	7 54 44 48 $\frac{1}{2}$ 51	1.9ca.	P's very small, felt at Asbestos, Upper Takaka, R-F 3.
		S M	55 07 09 12 15		
14	W	e	14 12 53 57		
		S	13 00 05		
15	W	P	2 18 08 13 $\frac{1}{2}$ 17 18 $\frac{1}{2}$ 22 $\frac{1}{2}$ 31	2.1	Felt in Hawkes Bay area, R-F 6 at Waipawa and Hastings, also felt as far as Gisborne, Taupo, Wanganui and Palmerston North. Epicentre near 39.7 S; 176.4E.
		S	34 $\frac{1}{2}$ 38 $\frac{1}{2}$ 40 $\frac{1}{2}$ 48 56 $\frac{1}{2}$		
	A	P*? S*?	19 03 $\frac{1}{2}$ 10 $\frac{1}{2}$ 15 24 40	1.6ca.	
			2 18 04 17 25 42 47		
	TU	P S M1 M2	19 05 2 18 (0) 9 $\frac{1}{2}$ 12 23 46		
	S	P* S M1 M2	2 18 (0) 5 19 $\frac{1}{2}$ 25 $\frac{1}{2}$ 28 31 34 38 $\frac{1}{2}$ 42 44	1.6	
	H	P M	2 18 (0) 05 52 19 07 29		Large motion; bumping on stopper caused some confirmation of record.
	C	P?	2 18 46 56 19 11 16 19 26 30 38 42 $\frac{1}{2}$ 56		Very small, perhaps microseisms.
		S	20 03 10		
				(cont.)	G.M.T. 36 51 56 21 26





DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Nov. 15	H	M	6 23 (0)		
15	W	e S	9 15 22 26		
15	H	P M	15 41 (0) 1 $\frac{1}{2}$ 05 07 16 21		
16	W	P S M	6 02 40 43 48 49 $\frac{1}{2}$ 51 55		
16	W	P S M	8 10 08 16 17 $\frac{1}{2}$ 19		cf. above.
16	W	P M	9 56 14 16 25 28 32 34		Felt Ekatahuna.
16	W	eP S?	19 40 30 37 40 43		
18	W		1 36 00		Small.
18	W		1 54 53		"
19	W	eP S M	00 11 11 30 37 ³³ 44		P very small.
23	W	eP	8 17 23 25 $\frac{1}{2}$ 30 35 39 $\frac{1}{2}$ 46 $\frac{1}{2}$ 51 18 03 $\frac{1}{2}$ 19 11 13 $\frac{1}{2}$ 16 $\frac{1}{2}$ 17 $\frac{1}{2}$	9.6	
	N	P S	8 17 (07) 18 46 51	8.8	Time a few seconds uncertain.
	C	P?	8 17 59 18 03 14 18 20 10 15	12.0?	See also Christchurch Distant Report.
23	C		12 14 11		Tremor
25	W		2 36 48		Small
	C		2 37 23 33		"

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Nov. 25	W		4 46 45		Tremors for 1 min. also Galitzin.
25	W		5 09 29		Tremor
25	W	P	5 35 37	0.6ca.	
			39		
			40 $\frac{1}{2}$		
		S	44 $\frac{1}{2}$		
		M	45		
			47 $\frac{1}{2}$		
			49 $\frac{1}{2}$		
			51		
			53 $\frac{1}{2}$		
			55		
	C	3?	5 36 28		
28	W		11 25 16		Tremor
30	W		6 24 24		
		S	32		
=		M	35		
30	W		8 07 03		Tremor



International
Seismological
Centre

NOTES:

Some shocks were missed during the month at NEW PLYMOUTH owing to clock stoppages, and the clock was removed for repair on 24th November.

No earthquakes were recorded at ROTORUA, TAKAKA, GREYMOUTH, and MONOWAI. KAITAIA was out of action.

An earthquake not recorded on any instrument was reported felt at GISBORNE on 20d 11h 12m - 'Slight jolting'.

In all three earthquakes were reported felt in the North Island, max. R-F 6 at VAIPAWA, and HASTINGS; and two in the South Island, max. R-F 3 at ASBESTOS, Upper Takaka and at GREYMOUTH and HOKITIKA.

PROVISIONAL EPICENTRES IN NEW ZEALAND
AND SOUTH-WEST PACIFIC: 1937 SEPTEMBER.

ORIGIN TIME (G.M.T.) 1937 a. h. m.	PROVISIONAL EPICENTRE		FOCAL DEPTH	REMARKS
	Lat. (deg.)	Long. (deg.)		
Sept. 1 08 40	31 S	179 W		Epicentre as given by J.S.A.
2 16 00	39 S	176 E		Felt at Dannevirke, R-F 3.
15 12 27	10 S	160 E	100 km ca.	Felt over most of Solomon Islands, max. at least R-F 8.
23 13 06	7 S	154 E		
28 10 30	41.2 SE	172.7 E		



The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological publications, received during the month of November, 1937:

Phu Lien . . . . .	.June; Pre.Sept.; Sept.
Weston . . . . .	.March - May
Hamburg . . . . .	.June - August.
Ottawa . . . . .	.July
La Paz . . . . .	.May - September, 1936.
Sydney . . . . .	.September.
Riverview . . . . .	.September, October.
HongKong . . . . .	.September preliminary; September
Brisbane . . . . .	.September - October.
Manila . . . . .	.October, preliminary
del Ebro . . . . .	.1935, 1936 October - December.
Kew . . . . .	.September.
Ksara . . . . .	.Provisional September.
Melbourne . . . . .	.July - Sept.; Pro. -October.
Schweizerisches Erdbebenbulletin Nos. 87,88.	
Bucarest . . . . .	.September.
Pasadena . . . . .	.August (Local Shocks)
Perth . . . . .	.July - August.
Adelaide . . . . .	.October(Preliminary)
Zi-Ka-Wai . . . . .	.September (Preliminary)
Nagoya . . . . .	.January - June, 1937.
Rathfarnham Castle . . . . .	.September.
Gottingen . . . . .	.July - December, 1936.
Pasadena . . . . .	.September, Local Shocks.
Manila . . . . .	.Pre. Oct.24; September.

.....000.....

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

Bulletin E69 1937 DEC

SEISMOLOGICAL REPORT FROM NEW ZEALAND STATIONS.

The report is divided into two parts:—

Part I gives readings of distant earthquakes ($\Delta > 10^\circ$ ca.); and Part II gives readings of local earthquakes ($\Delta < 10^\circ$ ca.). In both parts, where the clock correction is not known, the time of P (or first phase recorded) is enclosed in a bracket. Whenever they are definitely indicated, the trace amplitude and the direction of the vertical component of P are given. An upward ground movement is designated (+), and a downward movement (-).

In Part II determinations of absolute time are not attempted from Jaggard records, only the intervals between pulses being measured. In many cases the P movements are very small, and the first movement recorded is not necessarily P_n, or any other particular pulse.

Unless otherwise indicated, times recorded refer to the incidence of impulsive movements.

A list of provisional epicentres in New Zealand and the South-west Pacific is appended. The New Zealand epicentres are determined from the records of local stations, and the more distant ones with the assistance of data from Manila, Hong-Kong, Apia, Riverview, Sydney, Melbourne, and Adelaide. In the determination of South-west Pacific epicentres outside New Zealand, the travel-time tables of Wadati and Masuda are employed.

LIST OF NEW ZEALAND SEISMOGRAPH STATIONS.

Station Name and Abbreviation.	Position.		Height above M.S.L.	Lithologic Foundation.	Seismographs.	Observers.
	Latitude.	Longitude.				
Wellington (W) ..	41° 17' S	174° 46' E	Feet. 401	Greywacke	Milne-Shaw (N-S)* .. Galitzin-Wilip (Z)* .. Wood-Anderson (N-S)* .. Imamura (three components)* ..	Dominion Observatory, Central Station. Observers— C. N. M. Watson-Munro. W. M. Jones. Acting-Director— R. C. Hayes.
Kaitaia (K) ..	36° 6' S	173° 20' E	300	Claystones	Milne-Shaw (E-W)* ..	Mr. C. B. Michie.
Arapuni (A) ..	38° 5' S	175° 39' E	212	Rhyolite tuffs	Milne (E-W)* ..	Powerhouse Superintendent.
Rotorua (R) ..	38° 8' S	176° 15' E	930	Rhyolitic silts and gravels	Jaggard (E-W)	District Engineer, P.W. Dept.
Tuai (TU) ..	38° 48' S	177° 9' E	960	Gravels	Jaggard (E-W)	Resident Electrical Engineer.
New Plymouth (N) ..	39° 4' S	174° 4' E	112	Ash, agglomerate, and lava	Wood-Anderson (E-W)* ..	Superintendent, the Prison.
Stratford (S) ..	39° 21' S	174° 17' E	1,000	Water - sorted volcanic debris	Jaggard (E-W)	Mr. A. W. Burrell.
Hastings (H) ..	39° 38' S	176° 53' E	35	Alluvial sands, silts, and gravels	Jaggard (NE-SW)	Mr. H. de Denne.
Bunnythorpe (B) ..	40° 17' S	175° 36' E	197	Gravels, sands, and silts	Jaggard (NW-SE)	Mr. W. A. Waters.
Takaka (TA) ..	40° 51' S	172° 48' E	25	Alluvial gravels	Imamura (three components)* ..	The Postmaster.
Greymouth (G) ..	42° 25' S	171° 13' E	14	Deltaic sands and gravels	Jaggard (E-W)	District Engineer, P.W. Dept.
Christchurch (C) ..	43° 32' S	172° 37' E	25	Gravels	Galitzin (three components) Wood-Anderson (N-S)* ..	Magnetic Observatory. Director—H. F. Skey.
Monowai (M) ..	45° 47' S	167° 37' E	538	Tertiary sandstone	Jaggard (E-W)	Mr. A. Walker.
Chatham Islands (CH)	43° 57' S	176° 31' W	210	Volcanic breccia	Milne (E-W)*	Superintendent, Radio Station.

* Constants are given at the head of station registers.

Part I - Distant Earthquakes.

WELLINGTON.



Instrument Constants:

Milne-Shaw (N-S) Pend. period = 10.8 sec. Damping 20:1
Magnification 250

Galitzin-Wilip (Z) " " = 7.0 sec.
Galvanometer " " = 10.6 sec.

DATE	PHASE	G.M.T. h. m. s	PERIOD sec.	Δ deg.	REMARKS.
1937 Dec.2	eP? S i iSSS PcP? Lr	16 29 45 33 04 33 44 34 20 35 11 35 25		18ca.	
5	P PPP iS iSS i Lr	15 20 19 53 23 17 28 24 21 25		16ca.	Poorly defined.
7		19 20			Tremors
8	e M	08 54 09 08	15		Tremors
10	e L	13 51 14 11 ca.			Traces.
12	e S iSS i e iPcP? Lr M	07 59 45 08 01 18 23 02 12 45 03 36 03 30 04	ca. 15		
13	eP? S Lr	04 58 28 05 01 04 04			Very small
13	eP? eS i Lr M	13 32 33 34 56 35 11 37 39			Small and poorly defined.
13	P PP PPP S ScS Lq Lr	19 06 10 09 11 11 07 16 25 17 00 27 20 34	25	83	Ground movement +1m. followed by sharp movement - 2mm.
17	e	09 55			Tremors
18	e e M	02 41 45 49	12		
20	e M	03 51 59	15		Surface tremors
20	e M	22 49 54	15		Surface tremors
21		14 55ca.			Small tremors
22	e eL	04 15+ 20			Tremors
23	e i	03 02 07 13			Tremors

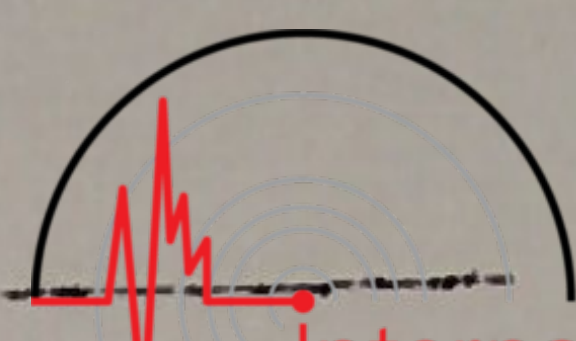
DATE 1937	PHASE	G.M.T. h. m. s	PERIOD sec.	Δ deg.	REMARKS
Dec. 23	P i PP PPP iSKS iSKKS SP eSS? iSSS? Lr M1 M2 M3	13 31 43 50 35 48 38 01 42 23 43 21 44 40 50 38 54 57 14 03 32 07 11 19		100	Epicentre in Gulf of Mexico. Large on H. " " " Well defined on Z.
24	eP? eS? Lr	06 47 30 55 55 07 06 47		62?	
25	iP Lr	01 19 11 41			Az. = +1mm.
25	e S Lq Lr	21 12 41 17 55 19 27 20 58			Strong on H.
28	iP i PcP? S Lq	03 18 43 19 27 46 26 17 30 50		53	Az. = -1mm.
28	e	07 21			Surface waves.
30	e	12 31			Surface waves.
31	e S i Lr	17 58 18 05 45 06 42 27 07			



CHRISTCHURCH.

(Provisional Readings)

Dec. 2	eNZ iZ iNE eNEZ	16 34 06 34 16 34 45 36 53			very small pulsations. small compression.
4	eN eEZ eNE	23 45 02 48 32 59 58	28 16		Shallow larger on N.
5	P? eS? iNZ eE eL iLNE iLNZ	15 22 41 24 22 24 35 24 51 25 35 26 03 27 57	20	8.9?	small, in microseisms. small pulsations, on Wood-Anderson. small small and indefinite larger on E. Surface waves follow for over 2 hours.
6		5 14 ca.			Seismic activity in strong micro- seisms.



DATE	PHASE	G.M.T.	PERIOD	Δ	REMARKS
1937		h. m. s.	sec.	deg.	
Dec. 7	eE	19 21 20	20		Shallow
	eNZ	23 20	18		"
8	eNE	1 10 24	20		Shallow
	eNZ	12 34	15		Very small on Z.
8	iP	8 44 26		79.5	N.T., compression, large dilatation follows.
	PP	47 33			
	S	54 30			
	iPSE	55 08			
	SS	59 51			
	LqE	07 20	44		later and larger on N.
	LrNZ	13 22	24		
	Lrw2NE	11 02 23			
	Lr	8 16 05	18		large and definite
	w2M	11 05 57			
	w3Lr	11 24 ca.			
8	ePNZ	16 52 54		36.6	small, in microseisms
	PcPNZ	54 31			compression
	iS	58 45		37.3?	ScP?
	iPcSZ	50			compression
	SS	01 12			
	LqE	38			
	eNEZ	2 28			ScS?
	LrNZ	4 32			
10		14 10 ca			Seismic activity.
11		17 36			" "
12	eP?	8 0 19			change of period in microseisms.
	eS	2 24			pulsations.
	eNE	2 24	20		
	eZ	3 02			small irregular waves, 8sec. ca.
	iNE	3 57			long period
	iNEZ	4 23			largest on E
	MN	7 24			range 114 microns.
	ME	7 46			" 96 "
	MZ	7 54			" 75 " , surface waves or 2 hours.
12	eP?	10 35 19			
	eS?	38 30			
	eE	37	20		
	eNE	39 11			Long period
13	LqE	5 04 06	30		
	LrNZ	5 32	18		small.
13	LqE	13 38 07	27		very small
	LrNZ	39 52	17		
13	iPNZ	19 06 11		83	Sharp compression
	ePE	06 11			Az. N.N.W.
	iPPEZ	09 19			emergent on N
	iS	16 31			largest on N, inconsistently with Az.
	iSSNE	22 00			larger on E. N.N.W.
	eZ	23			
	eNZ	25 04			
	SSSE	30			
	Lq	29 00	50		larger on N
	iLr	34 36	30		
	iEZ	38 45	20		surface waves smaller than PZ.
	ew2MNE	21 24 ca.			
	ew2NE	21 29 ca.	22		
17	PZ	9 44 33 ca.			no time eclipses
	eE	55 30			
	Lq	10 07 30 ca.			?, in erratic microseisms.
	eLr	16 ca.			
18	ePNZ	2 41 49		21.1	
	SNEZ	45 42			
	LqE	46 20	34		
	eLrZ	47 36			

DATE 1937	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Dec. 18	eNEZ iE iNZ iEZ	5 32 41 33 09 14 25			A near shock. small
18	PNZ eS LqE Lr	14 09 55 18 02 24 40 28 03		58.5	
18	ePNZ eSEZ LqE LrNZ	15 14 00 19 51 23 03 24 15		36.6	
18	ePNZ? LqE Lr	18 57 15 19 06 18 08 10			small in microseisms. small See bottom of page.
19		8 24 ca.			Slight seismic activity, no minute eclipse.
20	iPNZ SNE LqE eLrNZ	3 43 35 49 39 52 32 55 09		38.4	compression. larger on E.
20	eNE eNEZ	22 50 28 51 30	36 20		
21		14 53 ca.			slight seismic activity.
22	PEZ eSN SS Lr	4 03 36 11 48 15 57 21 17	59		compression doubtful, in large microseisms.
23		3 06 ca.			seismic activity.
23		8 50 ca.			" "
23	iP iPP iSKS SKKS iZ iPS Lr	13 32 24 36 31 42 58 43 58 45 22 45 59 14 05		106±	compression, from NE; absolute times very uncertain because of defective contacts. large
Two shocks on 24d. could not be interpreted because the time marking relay stuck intermittently.					
25	ePZ iSE LqE Lr	1 18 54 27 04 33 45 37 45	40 20	58.7	Compression
25	ePZ SN LrZ	21 00 03 08 16 20 38		59.1	Artificial disturbance of horizon- tal components makes interpretation doubtful.
27		16 03 ca.			Slight seismic activity.
28	ePEZ iEZ S LqN eLrEZ	3 18 22 18 44 26 12 31 44 35 48	34	55.5	small compression. Sharp compression, pP?, deep?; three 26 second waves on E.
28	eZ iZ eZ eNE eLrZN	6 40 59 42 17 49 55 7 15 40 26 09	50		compression, small 7 sec. period P' ? waves. small movements on microseisms which are about 60 seconds period on horizontal comps. larger on E.
18	eE eEZ	21 40 45 43 54	18		long period, but small. larger, poor on N.



DATE 1937	PHASE	G.M.T. h.m.s.	PERIOD sec.	Δ deg.	REMARKS.
Dec. 29		0 55 ca.			slight seismic activity.
29		4 11 ca.			" " "
29		12 36 ca.			" " "
30	eLqN eLrEZ	12 27 54 30 30			
31	ePPZ iSKSE eSKSNZ iSE PSEZ PPSE SS LrNZ	17 59 23 18 05 56 5 56 7 01 8 13 9 06 13 51 28 07		100±	small Lq not recognised.



International
Seismological
Centre

ARAPUNI.

Constants of Milne-Seismograph (E-W):

Pend. period = 25 sec. (Undamped)
Magnification = 5.6

Dec. 5	e M	15 22.9 23.5			
12	S	08 00+			In time mark
23	SKS e M SS Lq M	13 42.2 44.3 45 49.9 14 02.9 04			
31	e e eL	18 09 16 27			

CHATHAM ISLANDS.

Constants of Milne Seismograph (NE-SW)

Pend. period = 15 sec. (Undamped)
Magnification = 6.

Dec. 2	eS? M1 M2 M3	16 33.0 33.7 39 44.7			
5	eS? M1 M2 M3 M4	15 (23.5) 24.5 32.5 35.5 40.5			

Part II - Local Earthquakes

Instrument Constants:

WELLINGTON: Wood-Anderson Short-period seismograph N-S component
 Pendulum period = 0.45 secs.
 Imamura Strong-motion seismograph, three components,
 Pendulum periods N & S component = 6 sec.
 Z " = 4 sec.

CHRISTCHURCH: Wood-Anderson Short-period seismograph N-S component,
 Pendulum period = 0.74 sec.

NEW PLYMOUTH: Wood-Anderson short-period seismograph E-W component,
 Pendulum period = 0.55 sec.

TAKAKA : Imamura Strong-motion seismograph, three components,
 Pendulum periods N & S components = 6 sec.
 Z " = 2.5 sec.

DATE	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS
Dec. 1	W	S	10 47 24		Tremor
3	W	eP	04 42 28	1.7	Felt at Wanganui, R-F 3.
			34		
			40 $\frac{1}{2}$		
		S	47 $\frac{1}{2}$		
			49		
			54 $\frac{1}{2}$		
			59		
			43 03		
			08 $\frac{1}{2}$		
4	W		21 42 39		Tremor
5	W		07 05 37		Felt at Wanganui R-F 3.
			41		
5	W	e	17 00 32		Felt at Waipawa R-F 3.
		S	40		
	H		17 00 (00)		small
6	W	e	01 27 54		Tremor
8	W		19 20 15		Tremor
9	H		01 22 (0)		Tremor
10	C	M	00 10 21		
			26		
			30		
			38		
10	W	eP?	22 27 29		
		S	28 27		
		M	29		
			31		
11	W	P	09 08 31	4.8	
		S	09 25		
			27 $\frac{1}{2}$		
		M	30		
	C	?	09 09 46		
		S?	10 25		
12	W		10 36 16		Tremor
12	W		18 59 40		Tremor
	N		18 59 43		Traces
13	W		05 01 03		Tremor

DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS
Dec. 14	W	eP S M	09 41 16 38 39 $\frac{1}{2}$ 42 45 49 52 $\frac{1}{2}$	1.8	Felt at Asbestos R-F 5.
	C		09 41 45 53		very small.
17	W	eP S M	21 38 50 39 00 03 07 09 $\frac{1}{2}$ 10 $\frac{1}{2}$ 15	1.5	
18	W C	 P P?	05 33 37 34 02 05 32 42 45 49 56 33 02 05 09 $\frac{1}{2}$ 14 43 51		Traces Probably two shocks 20 sec. apart from within 100 Km. of Christchurch
18	N	P M	19 30 03 05		Felt at New Plymouth, R-F 2.
22	W N	eP S M P?	20 23 10 24 25 20 23 07 11 23 26	1.2	
27	W	P S M	04 14 46 50 55 $\frac{1}{2}$ 15 00 02	0.7	Felt at Blenheim, R-F 3.
28	N W	 eP	04 15 33 07 50 14		Traces Epicentre near 38.8S, 176.7 E.
			19 $\frac{1}{2}$ 22 $\frac{1}{2}$ 31 $\frac{1}{2}$ 34 $\frac{1}{2}$ 49 $\frac{1}{2}$ 52 $\frac{1}{2}$ 56 51 05 $\frac{1}{2}$ 09		
	TU	M e S?	07 50 (0) 14		
	N	M P S?	17 07 50 03 12 26 36 54	2.1ca.	
	H		07 50 (0) 4 $\frac{1}{2}$ 10 $\frac{1}{2}$ 14 $\frac{1}{2}$ 19 22 $\frac{1}{2}$ 26 $\frac{1}{2}$ 32 $\frac{1}{2}$	0.9ca.	



DATE 1937	STATION	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Dec. 28 (cont.)	C	S?	07 51 55 59 52 06		
28	W	eP	23 32 50 33 01		
29	W		04 43 01		Tremor
29	W	eP	13 15 59 16 02 $\frac{1}{2}$ 04 05 11 18	1.85	Felt at Waipawa, R-F 5, and Dannevirke. Epicentre 40°S, 176.4°E.
		S?	23 $\frac{1}{2}$ 25 $\frac{1}{2}$ 28 $\frac{1}{2}$ 32		
	N	P?	13 16 01 $\frac{1}{2}$ 07 17 23	2.0	
		S?	27		
		M	32		
	H		13 16 (0) 2 $\frac{1}{2}$ 4 $\frac{1}{2}$ 9 $\frac{1}{2}$ 12	0.6 ca.	
		M1			
		M2	15 $\frac{1}{2}$ 21 $\frac{1}{2}$ 28 $\frac{1}{2}$ 34 $\frac{1}{2}$ 43		
29	W	eP	14 20 34 37 $\frac{1}{2}$ 39 40 42 $\frac{1}{2}$ 46 49 52 $\frac{1}{2}$ 58 59	1.85	Felt at Waipawa, R-F 5. cf. above. Epicentre 40°S, 176.5°E.
		S	21 03 $\frac{1}{2}$ 06 $\frac{1}{2}$ 14 $\frac{1}{2}$ 20 $\frac{1}{2}$ 25 $\frac{1}{2}$		
	N	?	14 20 36 39 56	2.1	
		S?	21 00 05 09 19		
	H		14 20 (0) 04 $\frac{1}{2}$ 09 15 $\frac{1}{2}$ 18 28	0.6	
		M1			
		M2			
31	W	eP	12 31 38 52	1.2	
	N	S	12 31 54 58		
31	W	eP	18 39 19 26 $\frac{1}{2}$		
		S?			

NOTES:

The Wood-Anderson at New Plymouth resumed working on December 9.

No earthquakes were recorded at ROTORUA, TAKAKA, GREYMOUTH, and MONOWAI.

Earthquakes not recorded on any instrument were reported felt as follows:-

	d.	h.	m.	
Wanganui	2	14	10	Press Report.
"	2	14	20	" "
Wairoa and				
Waipiro Bay	8	08	20	R-F 4.
Dunedin	8	21	05	R-F 3 ca.
Gisborne	13	01	27	Press Report

In all ten earthquakes were reported felt in the North Island, maximum R-F 5 at Waipawa; and three in the South Island, maximum R-F 5 at Asbestos, Upper Takaka.

PROVISIONAL EPICENTRES IN NEW ZEALAND
AND SOUTH-WEST PACIFIC: 1937-OCTOBER .

Origin Time (G.M.T.) 1937 d. h. m.			Provisional Epicentre		Focal Depth	Remarks.
d.	h.	m.	Lat. (deg.)	Long. (deg.)		
Oct.	1	14	33	42.3 S	172.6 E	
	1	19	16	29 S	166 W	
	2	17	24	40.2 S	175.2 E	Felt North Island, max. R-F 4-5
	11	15	52	41.2 S	172.2 E	" South Island, " R-F 6
	12	02	16	40.8 S	172.7 E	" " " " R-F 4.
	12	03	10	55 S	145 E	
	12	08	40	39.6 S	176.7 E	" North " R-F 3.
	23	01	53	41 S	173.75 E	" about Cook Strait, R-F 4.
	23	16	54	37.9 S	177.8 E	" North Island, R-F 5-6
	25	10	34	37.9 S	177.8 E	" " " R-F 6.

The Acting-Director of the Dominion Observatory, gratefully acknowledges the following seismological publications, received during the month of December, 1937:-



Hong Kong	October Preliminary. October
Tananarive	April May.
Sydney	October
Ksara	October
Kew	October
Stuttgart	October
Phu Lien	July
Ottawa	August
U.S.C. & G.S.	April May, 1936.
Bucarest	October
Adelaide	November
Taihoku	September
Palau	May - October, 1936.
Melbourne	November
Brisbane	November
La Plata	July - October.

.....00000.....

DOMINION OBSERVATORY, WELLINGTON, W. I., NEW ZEALAND.

BULLETIN No. 135.

DOMINION OBSERVATORY.

REPORT ON THE ACTIVITIES OF THE DOMINION OBSERVATORY DURING THE YEAR ENDED 31ST DECEMBER, 1937.

BUILDINGS AND GROUNDS.

The Observatory buildings have been kept in good order. During the latter part of the year some of the officers of the Geophysical Survey were stationed at the Observatory, but in order to accommodate them arrangements had to be made with the Wellington Philosophical Society for the ante-room of their Observatory to be used temporarily as an office.

The Observatory grounds have been attended to periodically by the Wellington City Council.

TIME SERVICE.

Observatory Clocks.—During 1937 a total of 350 short-wave wireless time signals were received, from abroad, for checking the Observatory clocks. These were supplemented by 26 local transit observations. Interruptions in the daily checking due to disturbances in short-wave radio transmission made it more difficult to maintain the required accuracy in the time service, and errors exceeding half a second in the outgoing radio time signals occurred on three occasions during the year.

These circumstances point to the necessity of installing a precision clock at the Observatory, and as a step in this direction one of the Synchronome Co.'s Type B Slave clocks was installed in December. Just after the installation of this clock Mr. F. Hope-Jones, managing director of the Synchronome Co., London, visited the Observatory in the course of a world tour. He examined the clock, and expressed satisfaction with its installation.

Time Signals sent out.—The Observatory provides the following time signals, most of which are sent out automatically by the signal clock :—

(1) Time Signals by Radio :—

(a) Through Wellington Radio Station ZLW, daily at 10 h. 30 m. N.Z.M.T. (= 23 h. G.M.T.). In transmitting radio time signals the call sign of the Observatory is ZMO.

The following table indicates the order of accuracy of the ZLW signals during the year 1937 :—

Number of times error did not exceed 0.25 sec.	..	..	351
Number of times error between 0.25 and 0.50 sec.	..	..	11
Number of times error between 0.50 and 1.00 sec.	..	..	3
Number of times error exceeded 1.00 sec.	..	..	0

Total number of signals sent out 365

The errors of individual signals can be obtained on application to the Observatory.

There was a partial failure of the signals through ZLW on February 16, and a complete failure on April 13, both due to faults at the radio station. There was also a partial failure on April 24 due to a faulty clock contact at the Observatory.

(b) Through the National Broadcasting Stations, 2YA, Wellington, and 3YA, Christchurch, at 10 h. 30 m.; 15 h. 30 m.; and 19 h. 30 m. N.Z.M.T. (=23 h.; 4 h.; and 8 h.; G.M.T.) on week days and at 15 h. 30 m. N.Z.M.T. (=4 h. G.M.T.) on Sundays.

(2) Time Signals by Telegraph :—

(a) To the General Post Office and the Railways Department, Wellington, at 9 h. daily (except Sunday), for transmission to telegraph offices throughout New Zealand and railway-stations in the North Island.

(b) To the General Post Office, Wellington, for transmission to Auckland, at 20 h. 30 m. N.Z.M.T., on Tuesdays and Fridays. This signal was discontinued after October 31, 1937.

(3) Time Signals by Lights :—

(a) By signal lights exhibited at the Observatory daily at 20 h. 30 m., up to October 31, 1937.

(b) By signal lights exhibited at the Ferry Buildings, Auckland, transmitted to Auckland by telegraph, on Tuesdays and Fridays at 20 h. 30 m., up to October, 31, 1937.

The time signals by lights at Wellington and Auckland were discontinued after October 31, 1937. These signals were instituted in the early days of the Observatory for the benefit of seamen and others, but they have now been superseded by radio time signals.

(4) Time Signals by Telephone :—

Time signals are given in response to telephone calls. If specially required, the time is given to the nearest second; otherwise to the nearest minute only. During 1937 times to the nearest second were given on fifty-three occasions, and to the nearest minute on seventy-five occasions.

Public Clocks.—The Government Buildings clock was checked daily at 9 h. The rate of this clock is subject to erratic changes, and the error occasionally exceeds half a minute. The question of an automatic control from the Observatory is under consideration. During 1937 the maximum errors observed were 25 sec. fast and 61 sec. slow. On April 7 the clock was overhauled and reset by the Post and Telegraph Department. It was again adjusted on April 26.

The General Post Office clock was checked at 9 h. daily by observing the first stroke of the hour broadcast by station 2YA. The maximum errors observed during 1937 were 6 sec. fast and $9\frac{1}{2}$ sec. slow.

A synchronous electric clock was checked daily at 9 h. and 15 h. The maximum variation in the readings during 1937 was 21 sec. This variation was observed over a period of seventy days, which was the longest uninterrupted run of the clock during the year.

ASTRONOMY.

Apart from the time service, the official astronomical work of this Observatory is practically confined to solar observations and observations of occultations of stars by the moon. Other astronomical work, however, is carried out by Mr. Thomsen, in collaboration with the New Zealand Astronomical Society. This Observatory also makes provision for Mr. M. Geddes to carry out aurora and other astronomical observations in Southland.

Solar Observations.—During 1937 a total of 101 observations of sunspots was made with the 5 in. refractor of the Wellington Philosophical Society's Observatory. These observations are normally carried out by Mr. Thomsen, but during his absence at the solar eclipse in May and June the work was carried on by the Acting-Director. Results of the sunspot observations are sent to Zurich, and reports are published by the Solar Section of the New Zealand Astronomical Society. Reports of particularly active groups are also supplied to the local press.

Occultations.—Observations of occultations have been carried out by officers of this Observatory with the assistance of voluntary observers of the New Zealand Astronomical Society and in co-operation with the Wellington City Observatory. Occultations have also been observed at New Plymouth by the local astronomical society. During 1937 conditions for observing were not good, and consequently the number of observations was small. In order to facilitate the carrying-out of occultation observations, Mr. Thomsen keeps the 4 in. telescope and a chronometer at his residence. The New Zealand occultation observations are sent to the Computing Section of the British Astronomical Association.

Auroral Work.—The photographic recording of auroræ has been carried on in Southland under the direction of Mr. M. Geddes, assisted by Mr. D. C. Berry, of Invercargill. The two observing-stations are located at Winton and Invercargill respectively, giving a base line of about twenty miles. The installation of wireless as a better means of communication between the two stations has been proceeded with, and should be completed early in 1938. Better communication will result in a larger number of simultaneous photographs for the determination of the heights of auroræ. In the matter of establishing better communication, assistance given by the Radio Emergency Corps of the New Zealand Amateur Transmitters is gratefully acknowledged. During 1937 a number of important auroræ were recorded, and a total of 532 single photographs were taken, including 79 simultaneous sets. The working-up of these observations involves a considerable amount of labour, but a start has been made with the work. Reports of the aurora observations are published in the *Journal of the New Zealand Astronomical Society*, and Mr. Geddes also reports direct to Professor Stormer.

Solar Eclipse of June 8, 1937.—The expedition organized and led by Mr. C. W. B. Michie to observe the total solar eclipse of June 8, 1937, at Canton Island included Mr. I. L. Thomsen, of this Observatory, as official representative. The Department of Scientific and Industrial Research also made arrangements to enable Mr. M. Geddes to join the expedition. The expedition left Auckland by mail-steamer for Suva on May 14, and was conveyed thence to Canton Island in one of His Majesty's ships. Twelve days were spent on the island in preparation for the eclipse, which was observed under favourable conditions. After the eclipse, the expedition returned to New Zealand by way of Samoa. The results of observations of this eclipse appear to be very satisfactory. Preliminary reports have already been published in the *Journal of the New Zealand Astronomical Society* and elsewhere, while more detailed reports are still in course of preparation. The nine corona plates taken at Canton Island have been deposited at the Observatory by Mr. Michie.

Other Astronomical Work.—Other astronomical work carried out during the year included observations of the moon, Jupiter, Saturn, star clusters, and the zodiacal light, by Mr. Thomsen, the results of which have been published in the *Journal of the New Zealand Astronomical Society*. Mr. Thomsen gave lectures in astronomy at Wellington College and the Teachers' Training College. He also computed an ephemeris for Comet Finsler, which was well observed in the Northern Hemisphere.

A study of the spectrum observations of the eclipse of December 14, 1936, made by Mr. B. E. Stonehouse, was completed and published in the *Journal of the New Zealand Astronomical Society*.

Besides auroral work, Mr. Geddes has carried out other astronomical work, mainly solar observations, with the 5 in. refractor which he has on loan from this Observatory. Reports of his work are published in the *Journal of the New Zealand Astronomical Society*.

SEISMOLOGY.

Seismic Activity in New Zealand during 1937—Seismic activity in New Zealand during 1937 appears to have been slightly greater than during 1936. A larger number of shocks were reported felt, and the maximum intensity slightly exceeded that of 1936. The principal features of the activity in 1937 were as follows:—

- (1) Three moderately powerful shocks and six aftershocks, all occurring on June 3 in the Coromandel Peninsula.
- (2) Continuous activity along the zone of the main ranges of the North Island, preponderating between Dannevirke and Napier.
- (3) Continuous activity along the depression or graben to the west of the main ranges of the North Island; from Wanganui through Taupo and Rotorua to Whakatane.
- (4) Some minor shocks near New Plymouth.
- (5) Continuous activity in west and north-west Nelson, comprising mainly small shocks of shallow origin.
- (6) Occasional shocks in north Marlborough.
- (7) A few minor shocks in the vicinity of Akaroa Peninsula.
- (8) An occasional minor shock in Otago.

The North Auckland Peninsula has remained quite inactive. The apparent inactivity in the Southern Alps is somewhat surprising and may be due partly to lack of recording-stations in the region. Steps are being taken to establish one or two more reporting-stations on the west coast of the South Island.

A somewhat more detailed distribution of earthquake activity is shown on the accompanying map, where earthquake epicentres are indicated by black circles and crosses. The black circles indicate the positions of the 43 epicentres determined from seismograph records. Most of these are accurate to within about fifteen miles. The crosses indicate small shocks which it was possible to locate within about thirty miles solely from non-instrumental reports. Preliminary epicentres in the south-west Pacific generally are shown on the small inset map.

Information regarding felt earthquakes is furnished by officers of the Post and Telegraph Department, officers of the Marine Department, and several private observers. There are about 120 non-instrumental reporting stations distributed throughout the Dominion.

A total of 179 shocks was reported felt during the year, of which 126 were felt in some part of the North Island and 56 in some part of the South Island. Only three shocks were felt in both Islands. The maximum intensity was R.-F. 6-7, which occurred in the Hauraki Peninsula on June 3.

The following table shows the number of earthquakes reported felt and the maximum intensity reached, for each month of the year 1937:—

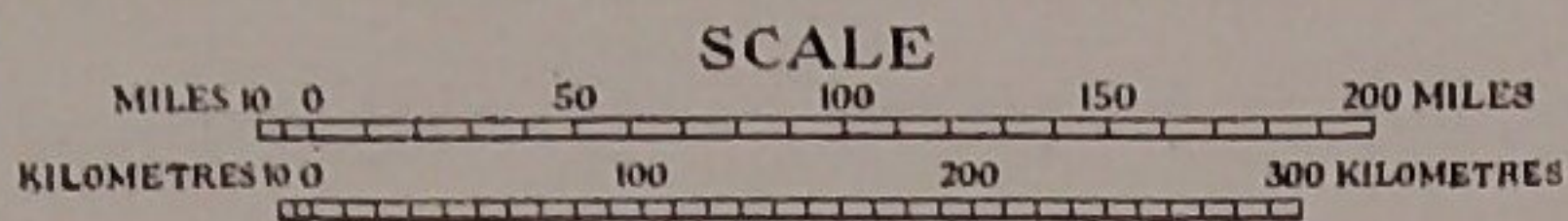
Month.	Number of Earthquakes reported felt.				Maximum Intensity R.-F.	Locality of Maximum.
	North Island.	South Island.	Both Islands.	Whole of New Zealand.		
January	15	4	..	19	5+	Waiotapu.
February	9	3	1	11	6	Hastings.
March	5	5	1	9	5	Stephens Island.
April	10	7	..	17	5+	Puysegur Point.
May	18	16	1	33	5	Whakatane.
June	17	3	..	20	6-7	Hauraki Peninsula.
July	13	1	..	14	6	Hawke's Bay, Manawatu.
August	6	7	..	13	5	Hicks Bay.
September	9	1	..	10	4	Dannevirke, Upper Takaka.
October	11	4	..	15	6	Opotiki, Kahurangi Point.
November	3	2	..	5	6	Southern Hawke's Bay.
December	10	3	..	13	5	Waipawa, Upper Takaka.
Totals	126	56	3	179	..	

The following list gives some particulars of those earthquakes during 1937 in which the maximum intensity reached or exceeded R.-F. 6:—

New Zealand Mean Time.	Approximate Position of Epicentre.		Remarks.
	Latitude.	Longitude.	
1937. d. h. m.	°	°	
Feb. 3 05 42 ..	..	..	Felt at Hastings, R.-F. 6.
Apr. 11 16 20 ..	45.5 S.	166 E.	Felt at Puysegur Point, R.-F. 5+.
June 3 11 34 ..	37.0 S.	175.8 E.	Felt in Hauraki Peninsula, max. R.-F. 6-7; also felt at Auckland.
July 8 00 20 ..	40.4 S.	175.6 E.	Felt in southern part of North Island, R.-F. 6 at Palmerston North.
13 22 22 ..	39.4 S.	177.25 E.	Felt fairly widely in North Island, max. R.-F. 6 in southern Hawke's Bay.
Oct. 12 03 22 ..	41.2 S.	172.2 E.	Felt in West Nelson region, max. R.-F. 6.
24 04 24 ..	37.9 S.	177.8 E.	Felt Raukaumera Peninsula, max. R.-F. 5-6.
25 22 04 ..	37.9 S.	177.8 E.	Felt at Opotiki, R.-F. 6.
Nov. 15 13 48 ..	39.7 S.	176.4 E.	Felt at Waipawa and Hastings, R.-F. 6.

DOMINION OBSERVATORY. NEW ZEALAND

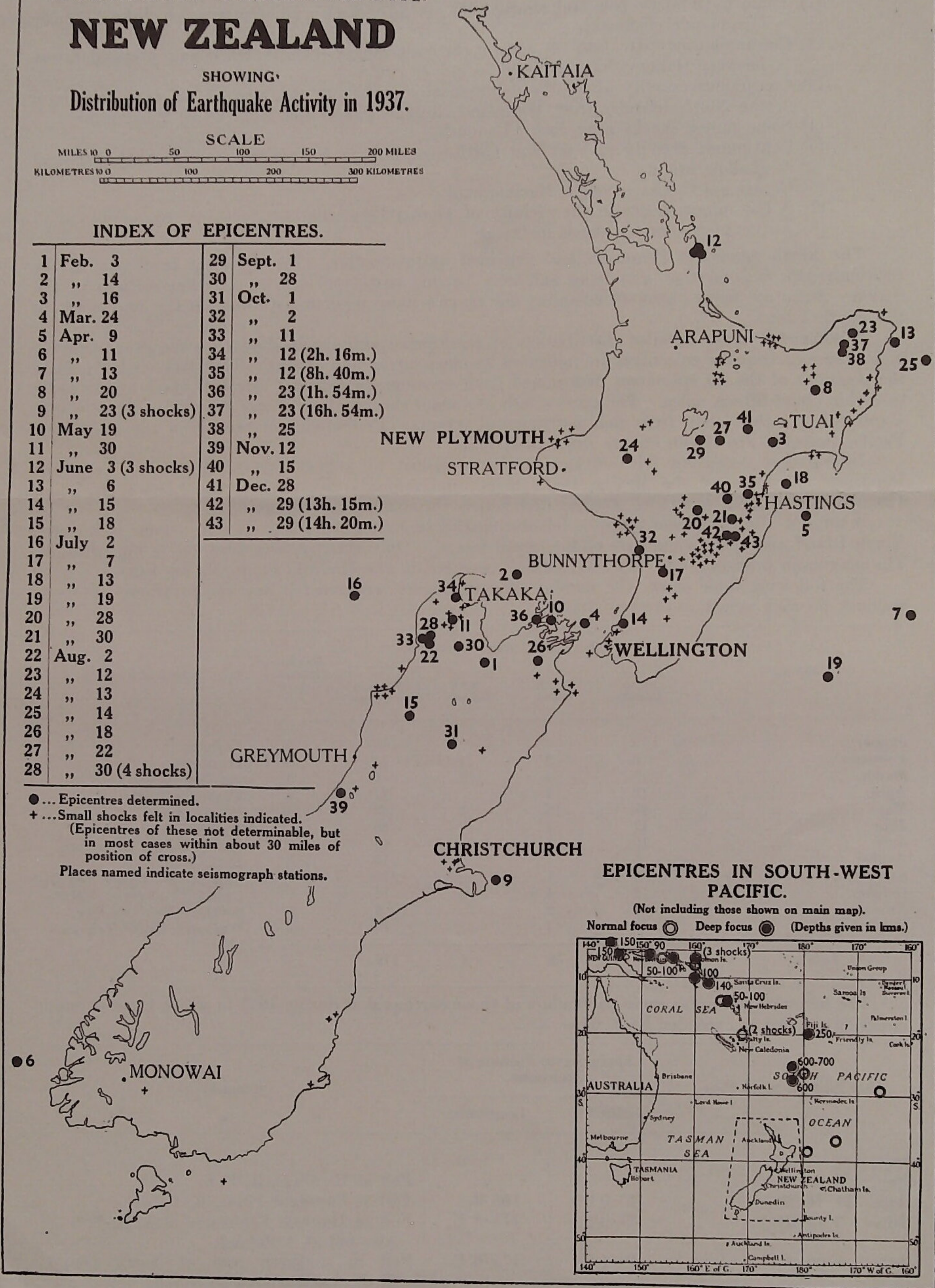
SHOWING
Distribution of Earthquake Activity in 1937.



INDEX OF EPICENTRES.

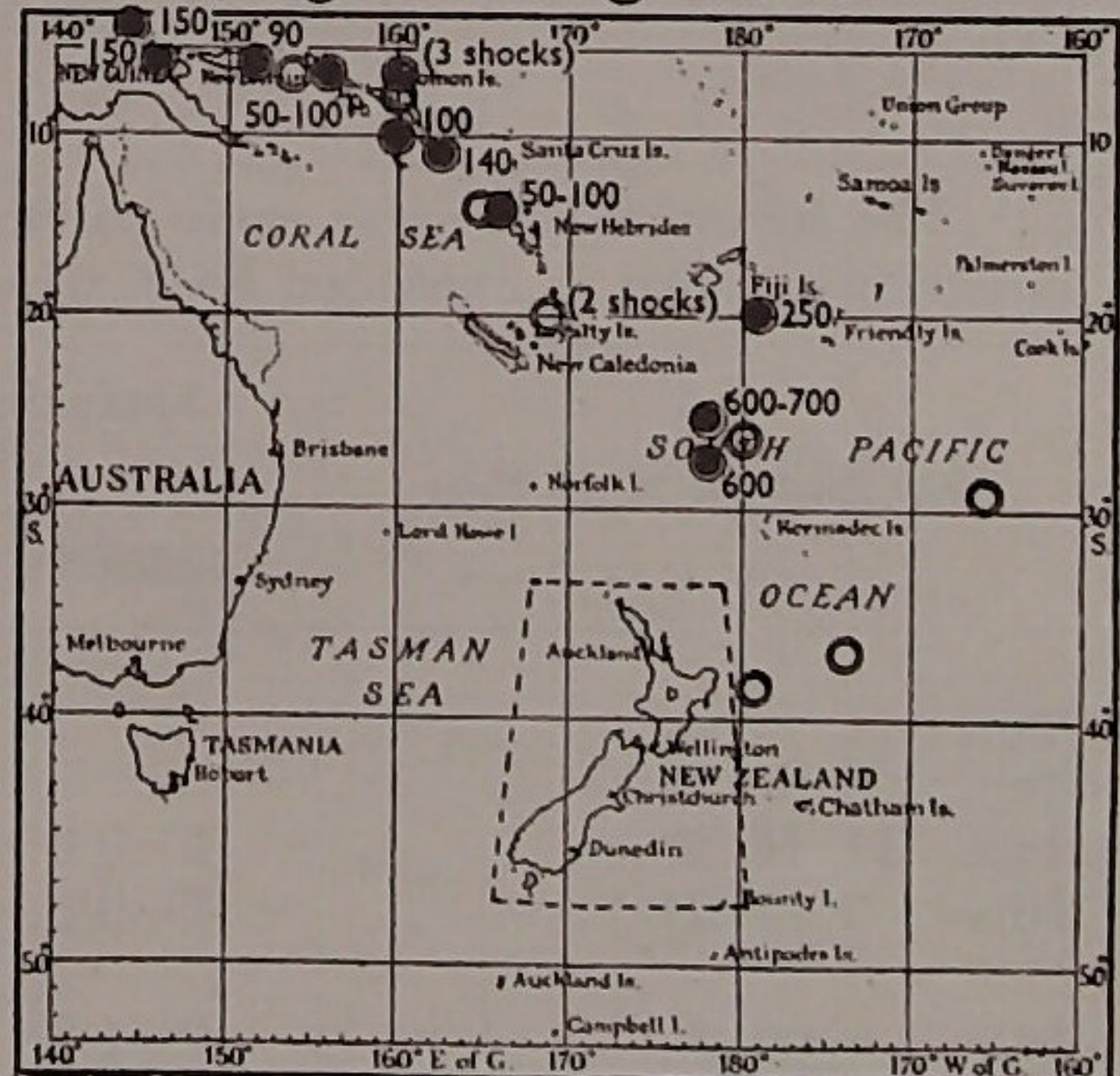
1 Feb. 3	29 Sept. 1
2 " 14	30 " 28
3 " 16	31 Oct. 1
4 Mar. 24	32 " 2
5 Apr. 9	33 " 11
6 " 11	34 " 12 (2h. 16m.)
7 " 13	35 " 12 (8h. 40m.)
8 " 20	36 " 23 (1h. 54m.)
9 " 23 (3 shocks)	37 " 23 (16h. 54m.)
10 May 19	38 " 25
11 " 30	39 Nov. 12
12 June 3 (3 shocks)	40 " 15
13 " 6	41 Dec. 28
14 " 15	42 " 29 (13h. 15m.)
15 " 18	43 " 29 (14h. 20m.)
16 July 2	
17 " 7	
18 " 13	
19 " 19	
20 " 28	
21 " 30	
22 Aug. 2	
23 " 12	
24 " 13	
25 " 14	
26 " 18	
27 " 22	
28 " 30 (4 shocks)	

● ... Epicentres determined.
+ ... Small shocks felt in localities indicated.
(Epicentres of these not determinable, but in most cases within about 30 miles of position of cross.)
Places named indicate seismograph stations.



EPICENTRES IN SOUTH-WEST PACIFIC.

(Not including those shown on main map).
Normal focus ○ Deep focus ● (Depths given in kms.)



Seismograph Stations.—Besides the Dominion Observatory, Wellington, and the Magnetic Observatory, Christchurch, thirteen subsidiary stations were operating in New Zealand during the whole or part of 1937. Eight of these are operated by officers of other Government Departments, two by officers of Electric-power Boards, and three by private individuals.

The following table gives the number of earthquakes recorded at the New Zealand Seismograph Stations during the year 1937 :—

Stations.	Jan.	Feb.	March.	April.	May.	June.	July.	Aug.	Sept.	Oct.	Nov.	Dec.	Total.
<i>Class I.</i>													
New Plymouth ..	10	16	5	7	1	13	9	14	12	13	3	7	110
Wellington ..	20	29	24	51	49	23	28	22	28	35	30	24	363
Christchurch ..	8	13	6	12	20	4	11	15	12	11	11	5	128
<i>Class II.</i>													
Rotorua ..	4	2	..	0	0	0	0	0	0	0	0	0	6
Tuai ..	..	1	1	2	1	0	1	3	0	4	1	1	15
Stratford ..	..	1	..	0	0	0	0	..	0	0	1	0	2
Hastings ..	5	9	2	5	1	2	7	1	2	4	3	5	46
Bunnythorpe ..	..	..	..	0	2	0	2	0	0	0	0	0	4
Takaka ..	1	3	..	0	0	0	1	0	0	0	0	0	5
Greymouth ..	..	..	..	0	0	0	0	0	0	0	0	0	0
Monowai ..	2	..	..	1	0	0	1	0	0	0	0	0	4
<i>Class III.</i>													
Kaitaia ..	..	..	1	..	..	..	..	..	..	..	..	..	1
Arapuni ..	9	3	1	3	2	6	7	5	10	3	6	4	59
Wellington ..	28	12	10	13	13	13	21	23	30	35	38	27	263
Chatham Islands ..	..	..	..	3	..	..	3	2	..	3	1	2	14
Christchurch ..	29	15	9	14	23	15	16	21	24	26	38	40	270

Blank spaces in the above table indicate that the records have been rendered incomplete through a temporary breakdown of the seismograph. It will be seen that in Class II there are gaps in the records of all the stations except Hastings; and in Class III for Kaitaia and Chatham Islands.

The stations in Class I possess sensitive Wood-Anderson seismographs for recording local earthquakes; those in Class II local strong-motion recorders, mostly of Jaggard type; and those in Class III teleseismic instruments only. As Wellington and Christchurch have both local and teleseismic instruments, these stations appear in both Classes I and III. The numbers recorded by stations in Class I therefore represent local earthquakes of all intensities. The greater number recorded at Wellington may be due partly to conditions being more favourable there for recording small local shocks, but also indicates greater activity in the region. The numbers in Class II represent only the more prominent local shocks, while those in Class III represent mostly distant earthquakes. Here the larger numbers recorded at Wellington and Christchurch are due to the instruments at these stations being more sensitive than those at Arapuni and Chatham Islands.

Improvements to the seismograph equipment at this Observatory carried out during the year include (1) the installation of a three-component strong-motion seismograph of low magnification for the recording of heavy local shocks; (2) improvement in the installation of the Wood-Anderson seismograph; and (3) the temporary erection of a Jones short-period vertical seismograph for the better recording of P-waves from small local shocks.

The E.-W. component Milne-Shaw was moved to Kaitaia in January to operate as a new station there. The records so far have been very incomplete owing to various difficulties arising in connection with the installation of the seismograph. The chief trouble appears to be due to excessive tilting of the ground in the locality of the seismograph station, but attempts are being made to overcome this.

The Jaggard station previously operating at East Cape lighthouse has been closed temporarily, it having been found impossible to maintain the seismograph there under present circumstances.

The Jaggard seismograph at Rotorua, formerly operated by the Tourist Department, was taken over by the Public Works Department in July.

The Wood-Anderson seismograph at New Plymouth suffered occasional interruptions during the year owing to stoppages of the driving clock. However, as the result of an overhaul of the clock carried out in November, and other adjustments made during the year, there has been a marked improvement in the records from this station.

In July the original Imamura strong-motion seismograph was re-installed at Takaka, and the station was equipped with apparatus for maintaining accurate timing on the records.

The installation of a new synchronome clock at the Magnetic Observatory, Christchurch, has resulted in an improvement in the timing on the records of this station.

Tiltometer.—During February, 1937, the Ishimoto Silica Tiltometer which was broken by the severe earthquake of March 5, 1934, was successfully repaired by Mr. J. M. Steele, of the National and Electrical Engineering Co., Auckland, and the instrument was re-installed in the Observatory cellar to record the E.-W. component of the tilting of the ground. It is considered that tilt records are likely to provide valuable data on local land movements, and may finally be of some assistance in the problem of earthquake prediction. It would be desirable to have tiltometers of some sort located in various parts of the country.

Research Work.—The following seismological research work was carried out by the Acting-Director during the year: (1) Further investigations into the effects of atmospheric pressure on the

occurrence of earthquakes, followed by publication of a paper on this subject; (2) preliminary investigation of the Observatory tilt records for the period 1930 to 1934, and the preparation of a report for publication.

The improvements to some of the seismograph stations recently carried out have enabled some definite progress to be made with the study of local earthquakes and related problems, but some additional well-equipped stations are required. Mr. Jones has made a detailed study of the data provided by recent local earthquakes, and has prepared some material for publication. At the same time Dr. Bullen has also been working on this problem, using earlier data. There appears to be reasonably good agreement between different investigators as to the general nature of the crustal structure in the New Zealand region, but a determination of the actual thickness of the various layers, the focal depths of local earthquakes, and the velocity of seismic waves cannot be satisfactorily carried out without some additional stations with sensitive local recorders and accurate timing apparatus. Steps are being taken to establish additional stations on these lines.

Dr. Bastings has been working on the determinations of south-west Pacific epicentres and related problems in co-operation with the Observatory.

Geophysical Work.—Mr. Watson-Munro carried out radioactive investigations from time to time during the year. In February and March he was engaged in magnetic work in the Rotorua district in connection with a survey of the volcanic and thermal regions by Dr. Arthur L. Day, of the Carnegie Institution of Washington.

Mr. Jones was engaged in magnetic work in the Takaka-Collingwood district during part of January and February.

These officers have furnished reports of their geophysical work direct to the Secretary of the Department.

Officers of the Geophysical Survey were stationed at the Observatory during the latter part of the year.

WORKSHOP.

During the year the Observatory workshop has been improved by the addition of a Driver electric-power drilling-machine, and a Starrett dial-test indicator, as well as tools and other small appliances. During the first part of the year the construction of a new Imamura strong-motion seismograph was carried on, and the work was completed in June. Further work on the construction of seismographs was interrupted owing to the workshop being required for urgent work on the apparatus for the geophysical survey during the latter part of the year. A large amount of instrument-making work is at present in hand.

The maintenance of a workshop at the Observatory has the advantage of enabling instruments to be constructed at considerably less cost than otherwise, and, in addition, urgent repairs can be carried out on the premises with a minimum loss of time.

PUBLICATIONS.

The Observatory has continued to publish a monthly cyclostyled seismological bulletin giving readings from all New Zealand seismograph stations. The bulletins published during 1937 cover the period 1936 January–April and 1936 December–1937 November.

The following Observatory bulletins were also published during 1937:—

- Bulletin 108.—A Subsoil Survey of Wellington City. (L. Bastings.)
- Bulletin 111.—The Seismicity of New Zealand Cities and Towns. (R. C. Hayes.)
- Bulletin 118.—Observations during the Disappearance of the Rings of Saturn, June, 1936. (I. L. Thomsen.)
- Bulletin 119.—Tables for the Reduction of Apparent Travel-times of P and S Seismic Waves. (K. E. Bullen.)
- Bulletin 120.—The Position of New Zealand Auroræ. (M. Geddes.)
- Bulletin 121.—The Seismological Aspects of the Wairoa Earthquake of September 16, 1932. (R. C. Hayes.)
- Bulletin 123.—The Hawke's Bay Earthquake of 1921, June 29. (K. E. Bullen.)
- Bulletin 124.—Earthquakes and Atmospheric Pressure (2nd paper). (R. C. Hayes.)
- Bulletin 125.—Annual Report of the Dominion Observatory for 1936.
- Bulletin 126.—Some Seismological Aspects of the Buller Earthquake—Part III. (L. Bastings.)
- Bulletin 127.—Some Seismological Aspects of the Buller Earthquake—Part IV. (L. Bastings.)

An article on "Earthquakes in New Zealand" was prepared for the "New Zealand Official Year-Book," 1938, and articles on "Time Service Arrangements" were prepared for the Year-Book and for the "New Zealand Nautical Almanac."

STAFF.

During 1937 the following officers were engaged in the Observatory work: Mr. I. L. Thomsen, Observatory Assistant; Mr. C. M. N. Watson-Munro, Observatory Assistant; Mr. W. M. Jones, Assistant Seismologist; Mr. G. S. Marshall, Instrument-maker; Miss K. R. Tullett, Shorthand-typiste.

R. C. HAYES, Acting-Director.