

15⁺ QUAR
1936

BULLETIN No. 48



DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

DOMINION OBSERVATORY.

WELLINGTON, N.Z.,
NEW ZEALAND.

SEISMOLOGICAL REPORTS

for

JANUARY, FEBRUARY, MARCH, 1936.

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

Tables used:

(1) for normal focus earthquakes ÷

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

and

(b) Pasadena Traveltime curves by B. Gutenberg and C. F.

Richter, 1934.

(2) for deep focus 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. Res. Inst. Vol. 9, p. 494, 193) and to R. C. Hayes (Dominion Observatory Bulletin, 107).

Observer. R. C. Hayes.

Director. C. E. Adams, D.Sc.,
F.R.A.S.

WELLINGTON (DOMINION OBSERVATORY)

Lat. $41^{\circ} 17' S$; Long. $174^{\circ} 46' E$. Height above M.S.L. = 401.5 ft.
Lithologic Foundation: Greywacke (early Mesozoic or late Palaeozoic).

INSTRUMENTS.

Milne-Shaw Seismographs, numbers 13 and 36, magnetic damping.
Wood-Anderson Short-period Seismograph, magnetic damping.
Galitzin-Wilip Vertical Seismograph, photo-galvanometric registration, magnetic-damping.

CONSTANTS.

Seismograph and component.	Date of Determination	Galvanometer Free Period.	Pendulum Free Period	Damping Ratio	AK L
Milne-Shaw (N)	1936 Feb. 19		10.4 sec.	20:1	
Milne-Shaw (E)	" " 19		10.6 "	20:1	
Wood-Anderson (N)	" " 20		0.52 "	9:1	
Galitzin-Wilip (Z) (Constants unreliable)	1934 Feb. 9	10.6 sec.	7.0 "	$\mu=+0.43$	160

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Jan. 2	P S i	10 34 27 39 45			
2	i e	17 44 30 50			Irregular movements.
2	P S i SS L M	22 46 30 56 25 55 23 1 37 10 20	8 30 20		
3	e	13 56			Tremors.
5	P S	1 34 19 35 5			Deep focus
5	P S	12 41 15 29			
7	e	23 5			
8	P S	5 49 0 21			
8	P S	18 57 59 58 7			
8		19 21			Local tremor.
9	e	23 40			Traces.
11		7 22			Local tremors.

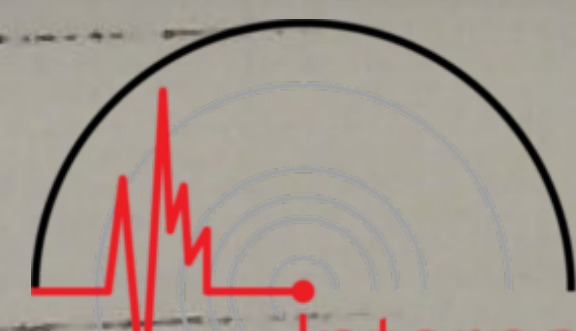
DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Jan.12	e	15 8			Traces
13	P S	0 36 54 37 2			
14		2 10			Local tremor.
14	P S SS Lq Lr	5 48 25 58 10 6 3 8 18	30 18		
14		11 51			Local tremor.
14	e i i	12 16 23 8 27 35			
14	i	14 34			Series of irregular tremors.
14	P pP PP S SS L M1 M2	17 46 21 30 51 50 32 51 30 62 15 54 56	9 17 15	23.6	Epicentre near 16 S, 165 E, (from Apia, Riverview, Welling- ton, Christchurch, Melbourne, Adelaide, Manila.)
15	eL	10 16	17		
15	P S L M	14 48 0 51 36 53 40 55	5 9 16 15	19.9	Approx. Az. = N. Epicentre near 21 S; 168 E. (from Apia, Wellington, Riverview, Christ- church, Melbourne).
15	P S L M	16 42 32 46 34 48 50	5 14		
16	eL M	7 19 23	16		
16	i	12 44			Tremors.
16		16 49			Local tremor.
16		18 31			" " , felt in North Canterbury, R-F 4.
17	P S	12 24 28 33			
19	eL	22 56	18		
20	P S ScS SS Lq L M	17 6 50 15 17 17 10 19 20 20 0 27 37	20 35 17		

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Jan. 21	e	1 38			Traces.
21	e	18 21			"
22		0 48	15		Tremors.
25		23 15			Local tremor.
27		1 37			" "
27	e	15 18			
27	P S L	21 23 41 26 1 27			Movements irregular.
28	e	2 33			Traces.
28		11 21			Local tremor.
28	P S	14 54 4 9			
30		13 7			Local tremor, phases not clear.
30	P S	14 1 2 6			
30	e	22 14			Irregular tremors.
Feb. 1	P S	6 35 3 11			
1		10 24			Local tremor.
1	P? S	12 40 26 41			
3	i	3 51 0			tremors. disturbed by microseisms
3		17 36			Local tremors.
4	P S	14 18 47 52			
4		23 43			Local tremor.
5	eL	6 59	19		Tremors.
7	P S? L M	0 52 25 57 50 1 1 3	19		Epicentre near 17 S, 177 W. (from Apia, Wellington, Pasadena)
7	e? L	9 32 40	30		Very small movements.
8	e	12 25			Tremors; stray microseisms.
10	e	0 55			Tremors.
10		0 55			Local tremors.
10	eL	4 58	20		
10		15 33			Local tremor.



DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Feb. 10	P e S? ScS sScS	18 10 14 12 35 13 10 20 12 24 0			Epicentre near 15 S, 174 W. (from Apia, Wellington, Riverview, Pasadena, Manila). Focal depth = 540 km.
11		8 27			Local tremor.
12		23 21			" "
13		13 8			" "
14	e	23 38			Traces.
15		2 33			Local tremor
15	P pP PP i PcS? S SS Lq Lr L M1 M2 M3	12 56 7 15 58 16 13 0 46 2 0 3 51 8 19 10 14 15 17 19 20	12 32 28 20 20 20 20		Focal depth 40 to 50 km. Fairly large amplitudes. " " " " " "
15	e	15 44			Tremors.
16	P i pP? S i PcP sS? ScP PcS? ScS	14 21 50 22 40 23 20 24 40 25 46 26 11 27 0 28 35 29 3 32 45			Epicentre near 20 S, 168 E (from Riverview, Wellington, Adelaide, Manila). Focal depth = 410 km.
16	P? S	14 44 36 43			P very feeble.
17		2 48			Local tremor.
17		3 20			" " , felt at Nelson, R-F 4.
21	e	5 2			Traces
21		9 32			Local tremor.
21		15 30			" "
21	P PP PPP? S SS ScS? Lq M	17 5 26 7 29 8 4 12 5 15 44 16 16 17 20 23	7 10 15		May be PcP. May be SSS.

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS+
Feb. 22	P PP? i S L M	15 34 32 35 12 36 15 37 10 38 39	15 12	very large ampli- tudes	Felt in extreme south of New Zealand as far north as Gore, Max. R-F 4. Epicentre near 54 S, 165 E. (from Christchurch, Wellington, Melbourne, Riverview, Adelaide, Apia)
22	P PP? S L?	19 25 25 26 10 28 14 29 10	6 11		Epicentre near 52 S 166 E. (from Christchurch, Wellington, Melbourne, Riverview, Adelaide.)
22	P S? L	19 32 48 35 25 37			Confused with previous shock.
22	L	21 21 10			
23	e	4 30			Tremors.
23	e	5 18			"
24		1 9			Local tremor.
24	P S	12 51 29 38			
25		20 52			Local tremor
27	P S? ScS? L M	10 13 13 20 35 21 59 27 29	13 11		Weak waves, apparently deep focus.
28	e eL	16 34 42			
29		7 19			Local tremor.
Mar. 1	e Lq M	10 44 40 50 30 58	40 15		
1	P i S	16 7 5 15 17			
2	S? L M1 M2	3 42 40 4 2 4 12	20 20 19		
3		19 31			Local tremors; felt at Dannevirke and Pahiatua, R-F 3.
4		23 40			Local tremors.
5	eL	6 40	23		Tremors.
6	P? S?	8 2 54 3 27		2.9?	Felt at Westport and Reefton, R-F 4. Epicentre near 42.6 S, 171.5 E. (from Greymouth, Wellington, Christchurch.)



DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS+
Mar. 6	P S SS L	14 30 34 34 26 35 44 36 25			Approximate epicentre 23 S, 173W (From Apia, Wellington, Pasadena)
8		15 36			Traces, heavy microseisms.
8	P i S	21 24 23 25 21 23		5.5	Deep focus.
10	eL	12 57			Traces, strong microseisms.
10	eL	21 16			Traces.
11	eL	17 13			"
12	P S	13 12 46 13 19			Felt at Dannevirke, R-F 2.
12		16 56			Local tremor.
14	eL	9 11			Irregular.
17	eL	20 37			Small.
18	e l	11 58 12 8 20			Irregular movements.
20	e L M	23 59 24 7 26 10	28 15		Very indefinite.
22	P PP PPP S SS Lq Lr M	12 23 10 24 34 50 28 40 31 20 31+ 34 38	12		Epicentre 10 S, 157 E, (from Riverview, Melbourne, Adelaide, Wellington, Manila.)
23		1 47			Local tremor; felt at Paekaka- riki, R-F 2.
25		1 25			Small local tremor.
25	P i i S i i	2 5 42 52 57 6 37 47 54		4.85	Felt in East Cape region and at Opotiki, R-F 4+
25		2 25			Feeble local tremor.
26		11 3			Local tremor.
26		15 15			" "
27	i L M	1 55 5 59 2 0	10 7		Local tremor
27		15 29			" tremors; felt in Manawatu district, R-F 4.
31		18 47			

EAST CAPE.

Lat. 37° 40' S, Long. 178° 35' E. Height above M. S. L. = 505 feet.

Lithologic Foundation: Rocks of the Upper Miocene Age.

INSTRUMENT: Milne-Jaggard Seismograph.

OBSERVER: The Lighthouse Keeper.

Jan. 7d 7h 15m slight local tremors were recorded and felt.

The Seismograph was out of action for the greater part of the period owing to clock trouble.

ARAPUNI.

Lat. 38° 5' S. Long. 175° 39' E. Height above M.S.L. = 212 feet.

Lithologic Foundation: Rhyolite Tuffs.

INSTRUMENT : Milne Seismograph E-W component, undamped.

CONSTANTS : Pendulum Period = 24 sec. (1934 Feb.) Magnification = 5.0

OBSERVER : Powerhouse Superintendent, Public Works Department.

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Jan. 2	S L M	22 57 0 23 14 24			
14	S L	5 58 54 6 10			
14	e	12 19			Tremors.
14	eP iS M	17 46 0 49 42 51		20.5	
15	eP? S	14 47 30 50 30		16.4?	P very small
15		16 50			Slight tremors.
20	S M	17 16 5 32			
Feb. 10		18 11			Tremors.
15	P S SS L M1 M2 M3	12 56 0 13 3 30 7 0 13 14 16 20		53.2	

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
Feb. 21	S SS L M	17 12 6 15 36 19 22			
22	P S L M	15 35 6 38 24 39+ 40		17.9	
22	S L	19 29 4 30+			
22	P? S	19 34 0 37 6		16.9?	Confused with previous shock.
27	eS? eL M	10 21 18 28 36 35			
Mar. 1	e? e M	10 44 54 56			
2	L	4 1			Tremors.
6	iL	14 34 30			
21		0 4			Tremors.
22	e M	12 32 33			
25	i	2 5 6			
27	e L	1 55 57			Tremors.

at TUAI no earthquakes were recorded during the period 1936
January 1st. to March 31st.

NEW PLYMOUTH.

Lat. $39^{\circ} 4' S$; Long. $174^{\circ} 4' E$. Height above M.S.L. = 112 feet.

Lithologic Foundation: Ash, agglomerate and lava.

INSTRUMENTS : (Station A) Wood-Anderson Seismograph.
(Station B) Milne-Jaggard Seismograph.

OBSERVERS : (Station A) The Superintendent, The Prison.
(Station B) Mr. C. E. Morshead, New Plymouth Hardware
Co.

DATE 1936.	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Jan. 2		3 43		Local shock.
2	P S	10 35(39) 57	1.6	
5	P S	12 42(43) 59	1.4	
14		17 46		Distant shock.
15	L	14 51		" "
27	P S	9 41(52) 42 5	1.1	
27		21 23		Distant tremors.
Feb. 16		14 22		Distant tremors.
Mar. 6	i? S	8 3(42) 58		Faint record.

at STRATFORD, HASTINGS, and BUNNYTHORPE no earthquakes were recorded during the period 1936 January 1st. to March 31st.

TAKAKA.

Lat. $40^{\circ} 51' S$; Long. $172^{\circ} 48' E$. Height above M.S.L. = 25 feet.

Lithologic Foundation : Alluvial gravels.

INSTRUMENT : Imamura Strong-motion seismograph, three components; oil damping.

CONSTANTS:

Component	Free Pendulum Period	Damping Ratio	Magnification.
N	10 sec.	6:1	2
E	10 "	6:1	2
Z	4 "	1.2:1	2

NOTE : Values of pendulum periods, and magnification as supplied by the makers.

OBSERVER : Mr. W. J. Smith, Postmaster.

Local tremors were recorded as follows :

1936 Mar. 22d., at 0h 58m, and at 17h+

GREYMOOUTH.

Lat. 42° 25' S, Long. 171° 13' E. Height above M.S.L. = 14 ft.

Lithologic Foundation : Deltaic sands and gravels.

INSTRUMENT : Milne-Jaggard Seismograph.

OBSERVER : District Engineer, Public Works Department.

DATE 1936	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Mar. 6	P S	8 2 (0) 5	0.4	

CHRISTCHURCH (MAGNETIC OBSERVATORY)

Lat. 43° 32' S; Long. 172° 37' E. Height above M.S.L. = 25 ft.

Lithologic Foundation : Gravels.

INSTRUMENT : Wood-Anderson Short-period seismograph, E-W component;
magnetic damping.

CONSTANTS : (1933 Sept.6) Free Period = 0.8 sec.
Damping = 0.85

OBSERVER : Director, Magnetic Observatory, Christchurch.

DATE 1936	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Jan.29		19 59		Local tremors. The seismograph was out of action from Jan. 8th - 22nd, owing to repairs to the driving clock. Tremors.
Feb.10		0 56		
10		18 13		Distant tremors.
22	P i S	15 34 1 35 33 37	10.6	
22		15 58		Small movements, confused with previous shock.
22		19 1		Tremors.
22	P? i S	19 25 35 26 35 27 21	9.4?	P very small
22	P? i?	19 32 15 33 40		Confused with previous shock.
22		20 23		Tremors.
22		20 43		"
22		21 18		"
27		10 13		Distant tremors.



DATE 1936	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Mar. 6	P S	8 2 45 3 1	1.4	
22		12 30		Distant tremors and L-waves.
25		2 6		Tremors; phases not clear owing to faint record.
27		1 55		Distant tremors.

at MONOWAI, no earthquakes were recorded during the period
1936 January 1st to March 31st.

CHATHAM ISLANDS.

Lat. $43^{\circ} 57' S$; Long. $176^{\circ} 31' W$; Height above M.S.L. = 210 ft.

Lithologic Foundation . Volcanic breccia.

INSTRUMENT : Milne Seismograph, NE-SW component, undamped.

CONSTANTS : Pendulum period = 10 sec. (1936 Jan.) Magnification=6

OBSERVER : Superintendent, Radio Station.

DATE 1936	PHASE	G.M.T. h.m. s.	Δ deg.	REMARKS.
Jan. 14	i	5 52+		Tremors.
14	eP S S ^s	17 46 (24) 51 24 52 24	30.3	
15	iS?	14 53 33		
20	eS?	17 16		Tremors.
Feb. 7	e	0 58		"
15	PP? L	13 1 24 18		
22	P S L M1 M2 M3 M4	15 34 (30) 38 0 39 36 41 43 44 47	19.2	Large amplitudes.
22	e S L M	19 28+ 30 (20) 31 36 32		
22	S? L M	19 37 (0) 38+ 39		Confused with previous shock.
22	e M	21 21 (30) 25		The seismograph was not recording during March.

MONOWAI.

Lat. $45^{\circ} 47' S$; Long. $167^{\circ} 37' E$. Height above M.S.L. = 538 ft.

Lithologic Foundation : Tertiary sandstone.

INSTRUMENT : Milne-Jaggard seismograph.

OBSERVER : Chief Engineer, Southland Power Board.

Date 1936	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
Feb. 22	eP i S L	15 33 (0) 30 34 10 50	6.2	
22	i	15 39		Tremors.
22		19 24		Tremors; record not clear.
22		21 18		Tremors.

SUPPLEMENT.Reports from Private Stations.DANNEVIRKE.

Lat. $40^{\circ} 13' S$; Long. $176^{\circ} 7' E$. Height above M.S.L. = 720 ft.

Lithologic Foundation : Alluvial deposits.

INSTRUMENT : Milne-Jaggard seismograph.

OBSERVER : L. Bastings, D. Sc., High School.

DATE 1936	PHASE	G M T h. m. s.	Δ deg.	REMARKS.
Mar. 3		19 32		Tremors.
31	P S	18 47 45 54	0.8	

GLENMUICK.

Lat. $42^{\circ} 54' S$. Long. $173^{\circ} 9' E$. Height above M.S.L. = 247 ft.

Lithologic Foundation : Gravels.

OBSERVER : Mr. C. J. Westland, F.R.A.S.

DATE 1936	PHASE	G M T h. m. s.	Δ deg.	REMARKS.
Jan. 9	M	5 25(22)		Small local shock, not felt.
16	P S	18 31(30) 38	0.7	
17	e	0 35		Long series of small movements.
Mar. 25		2 7		Series of small movements.
27	P S	8 7(56) 8 0	0.3	

2nd QUAR
1936

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

DOMINION OBSERVATORY,
WELLINGTON NEW ZEALAND



Preliminary Seismological Report for 1936, April (Number 92)

STATION	PHASE	G. M. T.				DISTANCE (degrees)	
		d	h	m	s		
Wellington	P=Apr. S=	1	2	19	50	62.2	Az. NW - WNW
Arapuni	P= S=		2	19	48	62.0	
New Plymouth	P= S=?		2	19(25)		68.?	
Apia	P= S=		2	20	4	63.2	Report from Director Apia Observatory;
Wellington	P=Apr S=	2	6	25	0	42.6	
Wellington	P=Apr S= ScS= sScS=	7	1	42	25	23.	Focal depth 100 km. (ScS-P) 90 km. (sScS-ScS)
Wellington	P=Apr S? =	9	7	17	32	20.6?	
Wellington	P=Apr S=	9	16	8	23	29.7	
Wellington	P=Apr S=	12	21	1	16	58.8	
Wellington	P=Apr pP= S=	19	5	14	27	36	Focal depth 100 km.+ (pP-P) from Brunner Depth Chart
Arapuni	P= S=		5	14	0	35.2	
Wellington	P=Apr S=	28	5	45	49	33.4	
Wellington	P=Apr S=	29	8	18	43	19.0	



We gratefully acknowledge the following seismological bulletins, received during the month of April, 1936.

Hong Kong	February, 1936
Taihoku	January, 1936 (Preliminary)
Institute Geografico y Catastral Servicio Sismologico, Boletin Mensuel, No. 122,123	January-December, 1935
Budapest,	July, 1935
Phu-Lien,	No. 3, 1936
Perth	March, 1936 (Preliminary)
Adelaide,	Jan-Feb-March, 1936
Apia	Dec. 28th, 1935: Jan 14th, 1936: Feb 15th, 1936:
Jesuit Seismological Association,	January, 1936
Pasadena	January-February, 1936
Toronto	April-May-June, 1935
Zagreb,	425, 426, 427, 428.
Volcano Letters	February, 1936
Ottawa	February, 1936
Kew	February-March, 1936
Riverview,	1933
Batavia	December, 1935
La Plata,	August, 1935: February, 1936:
Victoria	January, 1936
Bureau Centrale Seismologique Francais:	January, 1936
Parc Saint-Maur	January, 1936
Universite de Strasbourg,	January, 1936
Union Geodetic et Geophysique Internationale,	January, 1936
Dates Sismices de la Peninsula Iberica:	2 Trimestre de 1935.
Ksara, (Provisional)	February, 1936
Taiheku (Preliminary)	February, 1936
Schweizerisches Erdbebenbulletin,	No. 69
Earthquake Research Institute,	July-September, 1935
Praha	October-December, 1935
Chiufeng	February, 1936
Hong Kong	February, 1936
Madagascar	August, 1935
National Research Institute of Meteorology,	October-December, 1935
Osaka,	November-December, 1935

PROVISIONAL TIME SIGNAL CORRECTIONS. April, 1936



(All times are given in New Zealand Mean Time, which is 11h 30m in advance of Greenwich Mean Time).

1. Provisional correction to wireless time signals transmitted from the Dominion Observatory, ZMO, through station ZLW, on a wave of 500 kc./sec. (600m.) The corrections also apply to time signals transmitted at 10h 30m through stations 2YA and 3YA on waves of 570 kc./sec (526 m.) and 721 kc./sec. (416 m.) respectively.
2. Corrections to Wellington General Post Office Clock, as compared with the Dominion Observatory signal clock, except Saturdays, Sundays and Government holidays.

The wireless time signals on which the corrections are based are as follows:-

NPG = San Francisco short wave time signal				
NPM = Honolulu	"	"	"	"
NAA = Washington	"	"	"	"
FYB = Pontoise	"	"	"	"

A positive correction (+) indicates clock slow.
 A negative correction (-) indicates clock fast.

Date 1936 <u>Apr</u>	Correction to ZMO Signal at		Correction to G.P.O. Clock at 14h 30m
	10h30m	20h30m	
1	+0.1		-1 sec
2	+0.15		- $\frac{1}{2}$
3	-0.05	-0.05	- $\frac{1}{2}$
4	-0.1		
5	-0.3		
6	-0.2		-1
7	-0.15	-0.15	-2
8	-0.2		-2
9	-0.05		not broadcast
10	-0.1		
11	0.0		
12	-0.1		
13	+0.1		
14	-0.05	0.0	-3
15	-0.1		-3
16	-0.15		not broadcast
17	-0.05	0.0	-3
18	0.0		
19	0.0		
20	0.0		-2
21	-0.2	-0.15	0
22	-0.2		
23	-0.1		not broadcast
24	-0.1	-0.15	0
25	-0.1		
26	-0.1		
27	-0.05		-5
28	-0.05	0.0	-2
29	+0.1		
30	+0.05		

Electric Synchronous Clock: During April there was a variation of 9 seconds in the daily readings.

PROVISIONAL EARTHQUAKE BULLETIN, APRIL, 1936
MAGNETIC OBSERVATORY, CHRISTCHURCH



Date	Phase	G.M.T.	Distance in degrees-remarks
1936 April 1	iPNEZ	2 19 50	61.7, az. 305 \bar{E} Largest phase on Z before PcSScP.
	PcP	20.33	
	PR1	22.13	
	PoS	24.59	
	iS	28.20	very large on N.
	ScS	29.49	
	SR1	32.22	
	PcSScP	36.04	Very prominent on all components
	L	39.20	Largest on N.
	im	42.16	
	M	44.44	Followed by largest amplitudes of all, 20 second period.

Groups of surface waves round major arc began, N.E.4.28.5, NEZ.4.37.
4.47, NZ.4.58.5.

1.	eP	20.10.57	83.6
	PR1	14.12	
	PR2	16.05	
	PR3	18.20	
	S	21.20	impulse on Z
	SR2	30.15	
	SR3	34.45	
	L	38.37	
	M	45.08	

2	iP	6.25.08	Az.305
	iNEZ	27.21	
	eS	31.42	As P? through surface layers?
	iS	31.48	
	iN	35.19	
	iEZ	35.39	
	iNEZ	37.17	
	iL	38.37	Longest period on E and Z, may be very deep as assumed surface phases peculiar
	ME	41.44	
	MZ	42.00	

2 12.40.ca., slight seismic activity

3 11.44 ca. do.

7	ePN	0.39.47	20
	eL	46.25	
	eM	48.29	

7 9.07 ca., seismic activity.

8 eNE 4,36.30 ca. a few waves, 40 second period.

9	eP?	7.16.06	32.7?
	S	21.30	
	L	25.34	
	M	28.30	
	iP	16.08.38	

34, seems to be 170 km.deep on Brunner Chart, P, compression, on Z half as large as greatest later phase.

	pP	09.12	
	iS	13.54	Az.330 \pm
	sS	15.02	
	ScSZ	18.26	Surface waves present, but small.

12	iP	21.01.21	59, az.330, compression
	iPR1Z	03.36	
	PR2N	05.00	
	iS	09.33	Az.324
	iPS	09.49	very large, (reflected by North Queensland formation?)
	iSR1	13.34	
	L	19.53	



	imE	23.36	greatest amplitude of all.
	M		phases small and irregular
13		21.20	ca. seismic activity.
14	eP?	16.25.15	16.3?, in microseisms
	eS?	28.24	
	L	30.02	
	M	31.17	
15	e	6.37.07	
	eM	40.15	
15		19.37	ca. slight seismic activity
16	eP?	8.44.04	44.3?, in microseisms
	eS?	50.44	
	L	56.30	
	M	60.08	
18	eP?	0.46.48	26.6?, in microseisms
	eS?	51.28	
	eL	54.20	
	M	56.46	
18		5.44	ca. slight seismic activity.
19	iP	5.14.39	37.4, compression, Az. 300.
	iS	20.36	" 315
	Later movements too large to disentangle. At 9.45 ca. Long period waves prominent for almost 30 minutes, do not fit normal w phases, so possibly from different shock.		
24	eP	12.58.23	40.5?, in microseisms.
	PcPZ	13.00.27	
	PcSZ	4.09	
	eS	4.40	
	L	10.25	Most marked on N.
	M	13.57	do. EZ
26	eL?	0.20.57	More marked on E, component, but small.
	M?	24.01	Sharpest on N, small, amongst microseisms.
26	eP	8.42.44	68.3?, interpretation doubtful, suspected early phases amongst mic'sms
	ePR1	45.21	
	ePR2	46.42	
	eZ	49.00	
	eS	51.50	Sharpest on Z
	SR1	56.26	
	PcSScP	58.02	
	SR2	59.08	
	SR3	9.01.06	
	iEZ	1.38	
	L	4.44	
	e	7.40	Change to sharper waves
	M	9.40	Shorter period, but no larger.
	eZ	23.44.04	
	eNEZ	47.54	
	eNZ	59.28	
	eNEZ	24.12.40	
	eNEZ	25.01	
	eNE	30.30	
	eNE	42.00	40 second period
	eNEZ	48.14	
	eNEZ	59.10	



Apr 28	iPNZ	5.45.57	Not on E. 34.7
	iS	51.35	Small on Z
	SR1N	53.51	
	SR2	54.19	Very prominent on E.
	eLE	56.07	Poor on N.
	iScSE	56.18	Small on N.
	M	58.49	Most marked on N.
28	ePN?	14.51.56	19.2?
	eNE	53.02	Larger, S?, if origin more remote
	eSNZ	55.32	
	PcPNZ	56.10	
	L	57.40	
	PcS	59.48	
	ScSN	63.54	
29	eNE	3.24.15 L?	
		25.39 M?	followed by small regular waves.
29	iP	8.18.07	17.8, compression, small on E. probably NN.W.
	eSNE	21.15	With P? through surface layers?
	iS	21.30	
	iNEZ	22.06	
	iPcPN	22.45	
	iLE	22.56	
	iNZ	23.01	
	MZ	24.35	Followed by largest waves on NZ
	iPcSN	26-28	
	iScSN	29.56	Emergent on other components, early so focus slightly deep.
30	eP	23.01.17	17.9, in microseisms
	eSNZ	4.41	
	LE	6.22	
	MNZ	8.04	
	iN	12.44	ScS?.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.

DOMINION OBSERVATORY.

WELLINGTON, W.I.,
NEW ZEALAND.

SEISMOLOGICAL REPORTS

for

1936 APRIL.

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

Tables used:

(1) For normal focus 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 focus earthquakes:

- (a) Depth, Time, and Distance Chart by G.J. Brunner.
- (b) Tables by K. Wadati and K. Masuda.

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

Observer: R. C. Hayes.

Director: C. E. Adams, D.Sc.,
F.R.A.S.

WELLINGTON (DOMINION OBSERVATORY)

Lat. 41° 17' S. Long. 174° 46' E. Height above M.S.L. = 401.5 ft.
Lithologic Foundation - Greywacke (early Mesozoic or late Palaeozoic)

INSTRUMENTS.

Milne-Shaw Seismograph, numbers 13 and 36, magnetic damping.
Wood-Anderson Short-period Seismograph, magnetic damping.
Galitzin Wilip Vertical Seismograph, photo-galvanometric registration, magnetic damping.

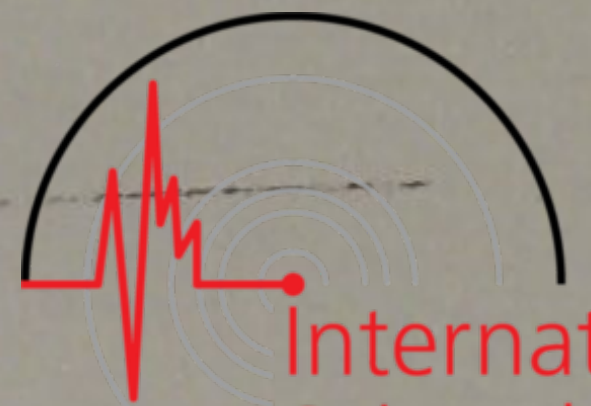
CONSTANTS.

Seismograph and component.	Date of Determination	Galvanometer Free Period	Pendulum Free Period	Damping Ratio	$\frac{AK}{\mu l}$
Milne-Shaw (N)	1936 Feb. 19		10.4 sec.	20:1	
Milne-Shaw (E)	" " 19		10.6 "	20:1	
Wood-Anderson (N)	" " 20		0.52 "	9:1	
Galitzin-Wilip (Z) (Constants unreliable)	1934 Feb. 9	10.6 sec.	7.0 "	$\mu=+0.43$	160

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
April 1	P S	1 39 10 17		0.5	
1	P PP PcS? S ScS? SS SSS? Lq L M1 M2 M3	2 19 50 22 5 24 43 28 15 28 50 32 45 35+ 37 42 43 46 49	8	62.2	Az. = NW - NW
1	e i L	20 14 29 45 34			Prolonged movements.
2	P PP? S SS L M1 M2	6 25 0 27 5 31 22 34 50 38 40 45	(May be PcP)	42.6	Provisional Epicentre 5 S, 150 E from Riverview, Adelaide, Christchurch, Wellington
3	P i S	13 41 14 27 40		2.3	Felt in central parts of the North Island, R-F 4.
7	P i S L? ScS SScS	1 42 25 45 9 46 15 47+ 53 30 54 10		23	Focal depth 90 -100 km. May be SS

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS
April 9	P S? L M	7 17 32 21 15 22 33 24	17 12	20.6?	
9	P i i S i Lq? Lr? M1 M2	16 8 23 9 15 43 13 20 46 16+ 17 52 18+ 22 26	13 14	29.7	Provisional Epicentre 73-162 E from Riverview, Adelaide, Christ- church, Wellington.
11	P S	9 7 22 32		0.9	
11	P S	10 1 58 2 7 17		1.7	
12	P PcS? S i e SS SSS L? M	21 1 16 5 10 9 21 50 12 25 14 12 16 30 25 27	16 12 19 14	58.8	
13	P S	20 27 3 10		0.6	
14	e	12 49			Tremors.
14	P? S	15 51 38 53		1.3?	P very indefinite. Felt in south- ern Hawke's Bay, R-F 3.
14	eL M	16 30 15 35	20 7		Irregular movements, no clear phases.
15		6 38			Traces.
16	eL	8 55			Tremors.
18	i L M	0 49 45 53 54	15		
19	P pP PP? S SS Lq L M	5 14 27 51 16 8 20 5 23 6 24 40 27 32	(may be PcP) 25 20 15	36	Provisional Epicentre 9 S, 157 E from Riverview, Adelaide, Christ- church, Wellington, Apia. Focal Depth 100 km. +
19	i eL M	9 27 54 47 58	18		





DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
April 21	P S	21 47 10 24		1.2	P very small.
21	P S	23 10 58 11 6		0.7	Felt at Carterton, R-F 3.
23	P S	1 29 55 30 5		0.9	
23	e	23 58			Traces.
24	P S	10 14 54 15 0		0.5	
24	eL	13 12			
26	e iS? iSS? L?	8 51+ 57 46 9 1 16 6	15		
27	eL	0 40			Traces.
28	P PP S SS L M	5 45 49 46 50 51 11 53 55 6 4	10 20 11	33.4	Provisional Epicentre near 19S 159 E, from Riverview, Adelaide, Christchurch, Wellington.
28	eL	13 57			Traces
29	e	3 26			Tremors.
29	P S L M	8 18 43 22 10 24 27	16 14	19.0	Provisional Epicentre 54 S 158 E from Riverview, Christchurch, Wellington.

In addition small local tremors were recorded as follows:
 April 3d 9h 1m, 10d 12h 3m, 10d 23h 15m, 11d 12h 47m, 14d 3h 24m
 22d 14h 42m, 23d 7h 28m, 26d 2h 17m, 27d 7h 42m, 28d 23h 53m
 30d 21h 49m.

ARAPUNI

Lat. $38^{\circ} 5' S$. Long. $175^{\circ} 39' E$. Height above M.S.L. = 212 ft.
 Lithologic Foundation - Rhyolite Tuffs.
 INSTRUMENT : Milne-Seismograph, E-W component, undamped.

CONSTANTS : Pendulum period = 24 sec. (1936 April), Magnification = 5.6

OBSERVER : Powerhouse Superintendent, Public Works Department.



DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	Δ deg.	REMARKS.
April	1	P PP S SS M L M	2 19 48 22 24 28 12 33 37 41 46	62.0	Large amplitudes. Tremors. In time mark. Tremors. " Record disturbed by changing paper.
	1	e	20 30		
	2	S M	6 30+ 40		
	7	e	1 45		
	9	e	7 20		
	9	e M	16 13 16		
	12	eS	21 9		
	14	L M	16 30 32		
	16	e	8 53		
	18		0 50		
19	P S SS iLq? L M	5 14 0 19 35 22+ 23 4 24 25	35.2		
	19	e			9 54
	28	S L			5 50 48 55+
	29	iS? L			8 23 33 25+

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Lat. $39^{\circ} 4' S$. Long. $174^{\circ} 4' E$. Height above M.S.L. = 112 ft.
Lithologic Foundation - Ash, agglomerate and lava.

INSTRUMENTS : (Station A) - Wood-Anderson Seismograph.
(Station B) - Milne-Jaggard Seismograph.

OBSERVERS : (Station A) - The Superintendent, The Prison.
(Station B) - Mr. C. E. Morshead, New Plymouth Hardware Company.

DATE 1936	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
April 1	P iS? L	2 19(25) 29 21 41	78.5?	
9		16 9		Distant shock.
12		21 2		" "
15		20 49		Local tremors, possibly not seismic.
19	P L	5 14 21 28		Distant shock.

HASTINGS.

Lat. $39^{\circ} 38' S$. Long. $176^{\circ} 53' E$. Height above M.S.L. = 35 ft.
Lithologic Foundation - Alluvial sands, silts and gravels.

INSTRUMENT : Milne-Jaggard Seismograph.

OBSERVER : Mr. Henry de Denne, 304 South Nelson Street, Hastings.

DATE 1936	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
April 3		13 42		Local tremor.
14	P S i	15 51 (0) 5 16	0.4	

CHRISTCHURCH (MAGNETIC OBSERVATORY)

Lat. $43^{\circ} 32' S$. Long. $172^{\circ} 37' E$. Height above M.S.L. = 25 ft.
Lithologic Foundation - Gravels.

INSTRUMENT: Wood-Anderson Short-period seismograph, E-W component,
Magnetic damping.

CONSTANTS : (1933, Sept. 6) Free Period = 0.8 sec.
Damping = 0.85

OBSERVER : Director, Magnetic Observatory.

DATE 1936	PHASE	G.M.T. h. m. s.	Δ deg.	REMARKS.
April 1	P i i L	2 19± 28 23 29 57 43		

DATE 1936	PHASE	G.M.T. h. m.s.	Δ deg.	REMARKS.
April 2		6 30		Distant tremors.
7		1 46		" "
9		16 8		" "
11	P? S	10 2 2 8	0.5	Small
14		16 30		Distant tremors.
19		5 14		Tremors and L-waves from distant shock.
28	L	5+		



At EAST CAPE, the seismograph was not recording owing to clock trouble.

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

The seismograph at CHATHAM ISLANDS was not recording during the month.

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH

DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.



SEISMOLOGICAL REPORTS FROM NEW ZEALAND STATIONS.

1936 ~~April~~ MAY

Tables used.-

- (1) For normal earthquakes - (a) Tables by H. Jeffreys and K.E. Bullen, 1935; 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. (feet)	Lithologic Foundation.	Observer.
	Latitude	Longitude			
WELLINGTON	41°17'S	174°46'E	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.	Superintendent, The Prison. (b) Mr. C.E. Morshead.
Stratford	39 21 S	174 17 E	1000	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, Public Works Dept.
(X) 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.

(X) = Privately-owned Station.

Note-- Commencing with 1936 May, the monthly preliminary reports, and the quarterly bulletins of this Observatory, will be replaced by a single bulletin of the present form; giving complete readings from the New Zealand stations. The separate provisional bulletin issued by the Magnetic Observatory, Christchurch, will be included, as previously.

R.C. Hayes.

Acting Director

WELLINGTON (DOMINION OBSERVATORY).

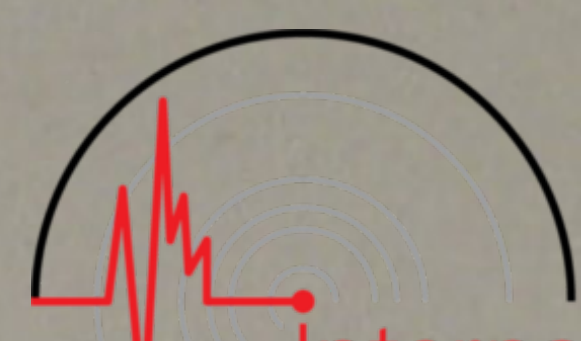
Instruments and constants:-

Milne-Shaw	(N-S)	Pend period = 9.8 sec.;	damping 20:1	(1936 May 19)
"	(E-W)	" " = 9.0 "	" 20:1	" May 21
Wood-Anderson	(N-S)	" " = 0.49 "	" 9:1	" May 20
Galitzin-Wilip	(Vertical)	" " = 7.0 "	$\mu = +0.43$	$\frac{Ak}{\pi L} = 160$
Galvanometer		" = 10.6 "		

All the above seismographs have magnetic damping.

The constants of the Galitzin-Wilip seismograph are unreliable on account of the difficulty in maintaining a sufficiently long pendulum period.

Date 1936	Phase	G. M. T. h m s	Period (sec).	Distance (deg.)	Remarks.
May 1	i i L	0 3 46 4 50 5+			Irregular; Phases poorly defined.
2	eL	11 42			
2	P S	13 59 39 14 0 13		3.0	
2	P S	15 42 24 49		2.2	
2	eL	16 59			Irregular.
3	P S	9 51 45 55			
4	P i S	0 49 29 32 34			Felt at Paekakariki R-F 3.
4	P S	11 0 53 57			
4	eL	20 5			Records disturbed by microseisms.
7	eL	22 44			
8	eL	2 21			Tremors.
8	P? e iL	5 56 22 57 5 59 20	14		P very small.
9	P? S? i	5 49 42 50 24 51 1		3.7?	P very small and indefinite. Felt in East Cape region max. R-F 6.
9	i? eL M	6 51 30 56 58	15		
11	P S	10 51 0 25			
11	P pP? PP? S SS? L M	17 35 10 32 37 10 41 19 44 45 47 16 51	28		May be PcP. May be Lq.



Date 1936	Phase	G. M. T.			Period (sec)	Distance (deg.)	Remarks.
		h	m	s			
May 11	eL	20	48				
13	eL	15	17			Tremors.	
14	i eL	5	3 5			Tremors.	
14	P S	20	11 17 42			Felt in N-W part of South Island. Max.R-F 4. Epicentre near 40.4S, 172.4E (Wellington and Christchurch.)	
16	i eL?	7	29 40 56	30			
16	P S	22	3 55 59				
18	P? S	15	56 11 20			P very small	
19	P? i eL? M	20 59 21 7 10 16 28		15			
20	P PP S SS? L M1 M2 M3 M4	3 11 59 13 18 17 25 20 10 21 0 25 27 30 33		20 13 14 13 11		May be Lq. Fairly large amplitude. " " " " " " " " "	
21	P S L	3 3 55 7 27 9 56		20			
22	P PP? S i L M1 M2	23 25 42 26 4 29 25 34 31 19 32 36		20 13			
23	P i S i	14 40 9 22 32 47			2.0	Felt in parts of Canterbury and Westland, max.R-F 6. Epi- centre near 42.8S 173.3E.	
23	P S	15 33 8 56			4.2	Felt in central districts, and eastern districts from Waipiro Bay to Christchurch; max.R-F 6. Epicentre near 40S, 180. deep focus.	
25	P? i i	3 20 39 23 45 30 20		15		Records disturbed by micro- seisms.	
26	P? S L	12 52 55 54 45 56					
27	P S	0 0 28 43				Felt at Wanganui, R-F 4.	



Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks.
May 27	P?	6 38 12			Very doubtful.
	PKKP?	53 23			
	L	7 18 29	20		
	M1	21	27		
	M2	25	16		
	M3 M4	30 34	20		
27	P	12 58 52			
	S	59			
28	P?	19 2 17			Train of regular waves.
	S?	12 39			
	i	13 8			
	SS?	20 10			
	L	30 44	24		
28	L	22 23+			Traces.



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In addition, small local tremors were recorded as follows:-
May 3d 8h 27m, 5d 11h 6m, 9d 6h 38m, 12d 12h 50m, 16d 20h 23m, 17d 12h 56m,
19d 9h 38m, 21d 4h 2m, 23d 3h 54m, 26d 9h 13m, 28d 22h 24m, 31d 9h 56m.

A R A P U N I.

Milne Seismograph, E-W compt., undamped; Pend-period = 24 secs. (1936 May);
Magnification = 5.5.

Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks.
May 1		0 3			Tremors.
9		5 49			Small local tremors.
11	S	17 41			
	SS	45 20			
	L	48			
20	S	3 16 50			May be SS
	Lq?	19 0			
	M	22			
22	S	23 28 50			
	L?	31			
23	i	15 33 36			
	S	34 4			
25	i	3 21			
	M	27			
27		12 55			Small local tremors.

T U A I

Milne-Jaggat Seismograph.
A small local movement was recorded on May 9d 5h 9m.

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

Station (a) Wood-Anderson Short-period seismograph.
" (b) Milne-Jaggat seismograph.

(2)

Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks
May 9	P? S	5 2 (4) 12			P very faint.
9	P i S	5 50 (13) 27 51 0		41	
9		6 39			Local tremor.
11		17 43			Distant tremors.
17		12 57			Local Tremor.
20	P S L?	3 11 (51) 17 3 20 14			
23	P i i	14 40 (50) 41 23 38			
23	P i i S?	15 33 (15) 47 53 34 6		4.5?	



S T R A T F O R D.

Milne-Jagggar Seismograph.
Tremors were recorded on May 23d 15h 34m.

H A S T I N G S

Milne-Jagggar Seismograph.

Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks.
May 23	P S	15 33 (0) 29		2.6	

T A K A K A

Imamura Strong-motion Seismograph; three components; oil damping.
Constants:- (N-S) and (E-W) components - free pendulum periods = 10 secs,
damping 5:1 (1936 May 28th). Vertical component-free pendulum period
= 4 secs, damping 1.5:1. The Magnification of all the components is 2.

Tremors were recorded on May 23d 15h 34m.

G R E Y M O U T H.

Milne-Jagggar seismograph.
May 23d P? = 14h 40m (0) s Distance 1.7°? P very doubtful.
S = 19

C H R I S T C H U R C H (M A G N E T I C O B S E R V A T O R Y) .

Local earthquakes ☒.

Wood-Anderson Short-period seismograph; magnetic damping.
Pend, period = 0.8 sec. damping = 0.85.

☒ = For readings of distant earthquakes, see Provisional Report of the
Magnetic Observatory, attached hereto.

DATE 1936	Phase	G. T. T. h m s	Period (sec)	Distance (deg)	Remarks.
May 8		5 56			Tremors; phases not clear.
9		5 50			Tremors
13		15 15			Tremors.
14	P S	20 11 23 42		1.9?	
23	P S	14 39 47 57		0.9	
23	P i S	15 33 39 59 34 49		6.2	

No earthquakes were recorded at MONOWAI during the month. The records at EAST CAPE and BUNNYTHORPE have been interrupted owing to clock trouble.

Provisional epicentres in New Zealand and the South-west Pacific; 1936 April

Origin Time (G.M.T.) 1936 d h m			Provisional Epicentre.		Focal Depth	Remarks.
			Lat. (deg)	Long. (deg)		
Apr. 2	6	17	18S	150E	Normal	Epicentre from Riverview, Adelaide, Christchurch and Wellington.
9	16	2	7S	162E	Normal	Epicentre from Riverview, Adelaide, Christchurch and Wellington.
19	5	7	9S	157E	100km.+	Epicentre from Riverview, Adelaide, Christchurch, Wellington and Apia.
28	5	39	19S	159E	Normal	Epicentre from Riverview, Adelaide, Christchurch and Wellington.
29	8	14	54S	158E	Normal	Epicentre from Riverview, Christchurch and Wellington

Data regarding earthquakes from observatories mentioned above are taken from their respective bulletins. The data for Apia are from a special report supplied by courtesy of the Director of the Apia Observatory.

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological bulletins, received during the month of May, 1936.

Parc Saint Maur	--February 1936
Union Geodesique et Geophysique Internationale	--February 1936
Kew	--March 1936
Universite de Strasbourg	--February 1936
Manila	--February 1936
Adelaide	--April 1936
La Plata	--February 1936
Florissant	--August 1935
Geophysical Abstracts	--March 1936
San Fernando	--February 1936
Granada	--August, September, 1935
Hong Kong	--1936 March (Preliminary)
Perth	--1936 No. 4, 5, 6.
Pasadena	--1936 February
Ksara	--1936 March (Preliminary)
Ottawa	--1936 March
Earthquake Notes	--1936 March

Bucarest
Chiufeng
Hong Kong
Sydney
Schweizerisches Erdbebenbulletin
Taihoku
Georgetown

-- 1936 January
-- 1936 March
-- 1936 March
-- 1936 April
-- 1936 March
-- 1936 March (Preliminary)
-- Seismological Despatches
july 1935.



MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN, MAY 1936.

Date	Phase	G.M.T.	Distance in Degrees-Remarks.
1d	eLNE eZ	11 43 5ca. 11 47 0ca.	in heavy microseisms.
5d	P S eL M	19 57 37 01 54 04 52 07 02	23.7, in microseisms.
7d	eNE eM?	22 47 44 52 30	small, paper just on.
8d	Slight seismic activity centreing at 2.24 ca.		
8d	eP? W-A,Z eNEZ iNEZ iNZ iE	5 53 57 55 31 55 56 56 55 57 22	
8d	iPZ ePRIZ iS	9 21 13 23 47 29 05	56+?, Probably deep, largest movement on Z. Azimuth E.N.E., Compression, Largest horizontal phase, poor surface waves.
9d	Slight seismic activity centreing at 2.46 ca.		
9d	ePZ? eNEZ eNEZ	5 51 26 52 23 52 55	Longer period.
9d	LE MNZ	6 56 42 58 43	
11d	iP PR2 PcP eN iS SR1 SR2 iNZ iScS? LE iN MN	17 35 20 37 12 37 30 39 57 41 36 44 10 44 52 45 12 45 26 47 22 49 56 50 40	40.3 Beginning of well formed train. from NW. Transverse counterpart of eN earlier. If correct interpretation and not of a sScSS type suggests retardation at core or some penetration as S.
11d	eNEZ	20 45 20ca.	shallow sinusoidal waves, if round major arc have same velocity of waves of greatest amplitude round minor arc on N and Z Component.
13d	Slight seismic activity commencing 16.15 33ca.		
14d	ePNZ SZ LE MNZ	5 02 41 05 43 06 49 08 11	15.6
14d	Slight close seismic activity 20 11 ca.		
16.	ePZ iNE SNE ScSZ? iPcSScPN SR1 SR2	7 22 00 29 45 31 49 32 31 36 53 37 09 40 07	77.0? sharp impulse, absent on Z.



Date	Phase	G.M.T.	Distance in degrees-Remarks.
16d	eM em	52 30 58 ca.	Love waves poor. More regular type, 24 second period.
19d	iP? iS	7 32 10 40 02	Deep?, very small surface waves on N only.
19d	iP ipP S isS	20 59 14 32 07 02 07 34	55.5, probably 80 km. deep, Brunner chart. Love waves on E, surface waves otherwise poor.
20d	ePNZ? eS? eL M	2 43 34 51 27 01 26 06 04	56.0?, small in microseisms.
20d	iP iSE iSNZ	3 12 16 17 50 17 54	34.2, on coda of earlier shock NW
21d	P? S? M	2 58 36 04 16 11 44	35.0? in long period microseisms.
22d	P? S LE M	0 50 42 55 12 57 36 59 56	25.4, small in microseisms.
22d	iP sP iS? ScS sScSN?	23 26 00 26 46 30 10 36 40 37 34	24.0, 130 km deep, Brunner chart. very near hour gap, largest amplitude.
23d	eP iS	14 39 45 [±] 39 56	1.0, probably N by E, hourmark failed, and clock rate altered R-F 5.
23d	eP iS	15 33 37 34 51	6.5, NE., probably deep widely felt R-F 4. Records one sided for some time as if brief tilt, Pulsations show on N for 20 minutes, as if from series of explosions or crunch of crystal structures.
23d	Slight seismic activity at 19.4 2ca.		
24d	Earthquake record while papers off, largest amplitude on E when papers on at 22 12 13.		
25d	P? S	3 16 22 21 25	29.7? in Microseisms.
26d	p? eS eLE M	11 45 47 51 06 55 25 57 00	32.7 32.7 in microseisms.
27d	PEZ iEZ SKSN S PSN SR1 SR2 LN	6 36 00 38 13 45 47 47 11 48 15 53 29 57 30 7 07 30	93.5 deep, reflection?

Date	Phase	G.M.T.	Distance in degrees- remarks.
28d	P	19 12 51	47.5
	S	19 51	
	L	27 23	
	M	31 39	
29d	P?	22 14 26	48.0?, doubtful.
	S?	21 29	
	L	29 04	
	M	33 26	



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

Sydney Oct.-Mar.
 Riverview, Nov.-Apr.
 Harvard, Bls.3 & 4.
 Pasadena, Oct.-Feb.
 Batavia, July-Dec.
 Tokyo, E.R.I., Imp. Univ. Part 2, 1935. Vol. XIII, part 4, 1935 Vol XIV pt.2,
 Part 3, 1935 Japanese Journal, Ast. & Geophy. XIII, 2
 J.S.A., Central Stn., pp32 -43 ppl, 2, 1936.
 Dr. J.B. Macelwane, S.J., extract from "Science" Feb. 28; 1936.
 Florissant, pp 16-19 1935.
 Academia Sinica, Vol. 3, No 1.
 Apia Oct. Mar.,
 Berkeley, Mr. Hamilton, Palo Alto, San Francisco, Ferndale, Vol.4 No.2
 Pennsylvania, July-Dec 1935.
 Melbourne Oct, - Mar.
 Hamburg, 1935 Nrs. 21-27
 Budapest, 1935.



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).

Instruments and constants:-

Milne-Shaw	(N-S)	Pend period = 9.7 sec.;	damping 20.1	(1936 June 16)
"	(E-W)	" " = 10.0 "	"	(1936 June 17)
Wood-Anderson	(N-S)	" " = 0.49 "	"	(1936 May 20)
Galitzin-Wilip	(Vertical)	" " = 7.0 "	$\mu = +0.43$	$\frac{Ak}{\pi L} = 160$
Galvanometer		" " = 10.6		

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All the seismographs have magnetic damping.

The constants of the Galitzin-Wilip seismograph are unreliable on account of the difficulty in maintaining a sufficiently long pendulum period.

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (deg)	Remarks
June 1	P?	11 28 42		52.1?	
	iPP?	30 49			
	iPPP?	31 19			
	S	36 5			
	iSS	39 54			
	iL?	43 21			L waves very weak; probably deep focus.
	M	48			
1	iL?	13 17			Tremors
2	P?	16 56 48		3.5?	P very small
	S	57 28			
3	iLq?	9 56			Tremors.
	eL	10 0			
4		19 17			May not be seismic
5	iP?	6 43 27		16.6?	
	iS?	46 29			
	iL?	48 43			
	M	51	20		
5		12 3			Tremors.
8	i	2 19 58			
	iL?	23 25			
	M	24	11		
9	i	16 53 45			
	iS?	57 30			
	i	17 11 45			
	eL	17 29			
	M ₁	20	23		
	M ₂	27	20		
10	iP?	6 24 37		0.7	
	S	45			
	i	54			
LO	P	8 31 11		41.5	Az.=NW. Focal depth 70-80 km.
	pP	29			
	iPP?	32 37			May be PcP
	iPPP	33 20			
	i	34 12			
	S	37 25			
	sS	38 0			
	iSS?	40 44			May be Lq.
	iSSS	41 29	10		
	L	43 10	25		
	M ₁	44	17		
	M ₂	47	15		

Date 1936	Phase	G.M.T.	Period (sec)	Distance (deg)	Remarks.
June 11	eL	13 15	20		Tremors.
12	P? S	1 11 21 27		0.5?	
12	iP S i	6 49 26 32 35		0.5	
12	P S	7 1 40 46		0.5	
12	P iS? i i	7 7 16 34 38 44		1.6?	Felt at Collingwood; R-F 3.
12	eL	16 5			Tremors.
13	P S	8 35 54 36 0		0.5	
16	iP? S? SS? L M ₁ M ₂	0 40 34 44 31 45 34 46 31 50 51	11 10		
22	iP? iS? eL M ₁ M ₂ M ₃	8 33 24 38 54 43 20 46 49 52	17 13 11		
22	i? eL M ₁ M ₂ M ₃	11 1 21 4 24 7 11x 14	15 13 10		
23	e L? M ₁ M ₂ M ₃	22 13 18 47 23 27 30	13 12 11		Records distributed by changing papers.
24	P S	5 22 29 49		1.7	
25	P iS? i	10 31 43 59 32 4		1.4?	
28	P S	6 17 57 18 4		0.6	
28	eL M	6 57 59	12		
30	P i i i iPP i iPPP? SKS	15 19 51 20 7 16 30 23 33 24 10 25 28 30 45		98	Az. = NNE.



Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks
June 30	S	15 31 20			
	iPS	32 20			
	iPPS?	33 18			
	SS	37 51			
	iSSS	41 9			
	Lq	44 33	40 ±		
	Lr	50 0	26		
	M ₁	56	20		
	M ₂	16 10	17		



In addition, small local tremors were recorded as follows:-

June 3d 0h 57m, 5d 7h 14m, 9d 20h 27m, 9d 21h 4m, (doubtful), 12d 13h 31m,
12d 21h 25m, 13d 4h 28m, 14d 2h 37m, 21d 23h 28m, 22d 4h 27m,
23d 20h 30m, 26d 3h 27m, 28d 8h 12m, 30d 22h, 0m.

A R A A P U N I

Milne Seismograph, E-W compt., undamped; Pend-period = 24secs. (1936 June);
Magnification = 5.5.

Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks
June 10	S	8 37 10			
	iSS	40.5			
	L?	41.7			
16	iS?	0 44.7			
	L?	46			
30	S	15 31			In time eclipse.
	iSS?	36.5			
	Lq	43.5			
	Lr	50			
	M	53			

X

N E W P L Y M O U T H

Station (a) Wood-Anderson Short period seismograph.
" (b) Milne-Jaggat seismograph.

Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks.
June 10	P	8 31 (0)		40.1?	May be PcP.
	iPP?	32 41			
	S	37 8			
	eL?	43			
30	P	15 19 (40)		91	
	i	20 1			
	SKS	30 20			
	S	39			
	eL?	50			

C H R I S T C H U R C H (MAGNETIC OBSERVATORY).

Local earthquakes ☒.

Wood-Anderson Short-period seismograph, magnetic damping.
Pend, period = 0.8 sec. damping = 0.85.

Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks.
June 21	P S	17 24 43 49		0.5	
29	P S	20 37 46 38 0		1.2	



☒ = For readings of distant earthquakes, see Provisional Report of the Magnetic Observatory, attached hereto.

C H A T H A M-I S L A N D S .

Milne seismograph, NE-SW component, undamped, Pend period (1936 June) = 10 secs; Magnification = 6.

Date 1936	Phase	G. M. T. h m s	Period (sec)	Distance (deg)	Remarks.
May 8	e	5 53			Tremors.

N O T E S .

No earthquakes were recorded during the month at TUAI, STRATFORD, HASTINGS, GREYMOUTH, MONOWAI. At EAST CAPE and BUNNYTHORPE the seismographs were out of action on account of repairs being necessary to the recording apparatus.

The records at TAKAKA were interrupted after June 8th, owing to a change in equipment. The Imamura seismograph was removed to Wellington, and was replaced by a Milne-Jaggar.

Provisional Epicentres in New Zealand and the South-west Pacific; 1936 May.

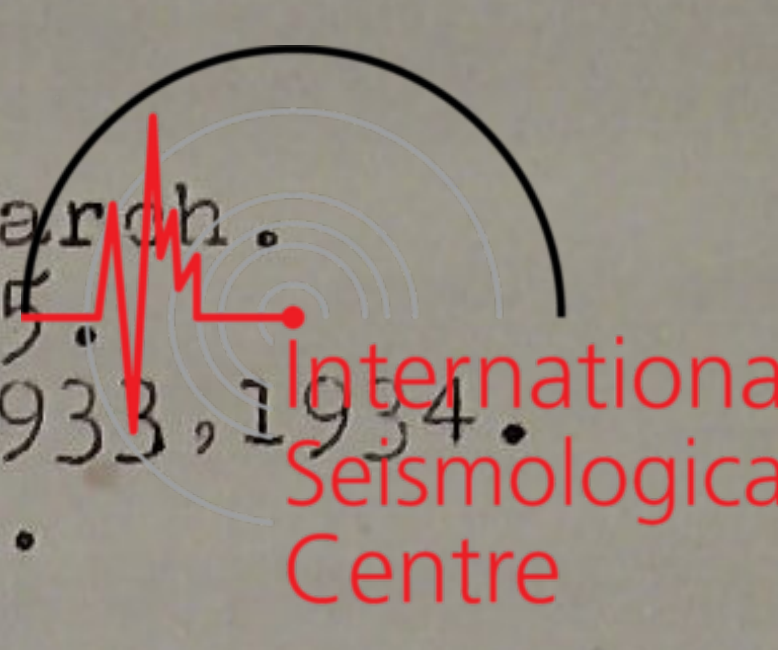
Origin Time (G.M.T.) 1936. d h m	Provisional Epicentre		Focal Depth	Remarks.
	Lat. (deg)	Long. (deg)		
May 11 17 27	7 S	151 E	100km?	Epicentre from Riverview, Wellington, Christchurch, Manila.
14 20 11	40.4 S	172.4 E	Normal	Felt in NW part of South Island of New Zealand; max. R-F 4.
20 3 5	10 S	160 E	Normal	Epicentre from Wellington, Riverview, Christchurch, Manila.
22 23 21	22 S	169 E	130 km.	Epicentre from Wellington, (Christchurch) Riverview, Christchurch, Manila.
23 14 39	42.8 S	173.3 E	Normal	Felt in parts of Canterbury and Westland, New Zealand, max. R-F 6.
23 15 32	40 S	180	Deep.	Felt in central and eastern districts of New Zealand, max. R-F 6.

Note - Data regarding earthquakes from observatories mentioned above are taken from their respective bulletins.

Correction to Bulletin E 50.

Page 6 - Provisional Epicentres in New Zealand and South-west Pacific, 1936 April; Earthquake of 1936 April 2d 6h 17m, for 18 S, read 5S.

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological publications received during the month of June, 1936.



Melbourne	-- Bulletin No 33, 1936 Jan.-March.
Datos Sismicos de la Peninsula Iberica	-- 3 ^{or} Inneestre de 1935.
Boletin del Servicio Sismologico de la Universidad de Chili	-- 1933, 1934.
Rathfarnham Castle, Dublin	-- January-March, 1936.
Sydney	-- April, 1936.
Manila	-- March, 1936.
Adelaide	-- May, 1936, Preliminary.
Florissant	-- Sept.-Oct. 1935.
Hong Kong	-- April, 1936, Preliminary.
Phy-Bien	-- September, 1935.
Pasadena	-- March, 1936.
De Bilt	-- 1933.
Riverview	-- 1936 May.
Taihoku	-- 1936 April.
Chiufeng	-- 1936 April.
La Paz	-- 1935 June, October.
Parc St.Maur	-- 1936 March.
Strasbourg	-- 1936 March.
Union Geodesique et Geophysique Internationale	-- -- 1936 March.
Kew	-- 1936 April.
Toronto	-- 1936, March, April.
Victoria	-- 1936 February, March.
Sofia	-- 1935 Septenoer-December.
Ottawa	-- 1936 April.
La Plata	-- 1936 February, March.
Hong Kong.	-- 1936 April.
Manila	-- 1936 April.
Nunadu	-- 1935 Jan.-Dec.
Nagoya	-- 1935 July - December.
Sydney	-- 1936 May.
Kobe	-- 1934 Oct.-Dec.
Tokyo, Earthquake Research Inst.	-- 1935 Oct.-Dec.

MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN, JUNE 1936.

Date	Phase	G. M. T.	Distance in degrees - remarks.
1d.	eP?	11 25 32	20.0, small, in microseisms.
	eS	29 15	
	eM	33 07	
1d.	P	12 45 32	88 _± , doubtful, small in microseisms.
	eSKS	55 48	
	eSR ₁	02 08	
	eSR ₂	13 05 22	
	LN	13 12	
	M	19 36	
2d.	eL	3.37, ca., largest on N, irregular disturbance fo 15mins.	
2d.	P?	9 26 29	87 _± , doubtful, small amplitudes.
	SKS	36 48	
	eSR ₁	43 00	
	eSR ₂	46 28	
	eL	56 08	
	M	03 14	
5d.	iPNZ	14 47 33	Largest phase on Z, compression, deep.
	iS	55 45	
	e	58 45	Surface waves small.
6d.	eP	6 43 43	19.8
	S	47 33	
	LE	49 39	
	MNZ	51 46	



Date	Phase	G.M.T.	Distance in degrees - remarks.
6d.	eL eMNZ	12 03 06 05 07	Small.
8d.	Slight seismic activity commenced 2.20.5 ca.		
9d.	P eS L M	16 58 22 06 16 15 38 20 22	56 2?, in short period Mic'sms.
10d.	iP ipPz iPcP iS SHINE iScSZ	8 31 18 31 55 33 02 38 44 41 06 41 26	43.2, 170km. deep, by Brunner Depth Chart, Comp., Az. N.W. Largest phase on N. With ScS makes large amplitude. Surface waves largest on E.
11d.	13. 16. 0 ca., beginning of slight irregular activity.		
12d.	eP eS LE M	15 58 49 16 02 45 04 58 06 59	21.5?, small, in microseisms.
14d.	Slight seismic activity centring at 0h 30 ca.		
16d.	eP? S? L	0 43 32 46 58 48 09	18.0?, masked by large microseisms.
21d.	eP eS	17 24 44 51	0.6, R-F 3, small felt on Banks Peninsula. Apparently from south.
22d.	eL eM	8 44 19 46 26	
22d.	eP? eS LE M	10 57 50 02 28 05 10 07 34	26.4?, small, in microseisms.
22d.	Papers on 22 22 58, disturbance running.		
28d.	eL M	7 55 22 57 05	Masked by large microseisms
30d.	eP? eS? L M	01 54 46 02 00 09 04 11 06 52	32.6?, in strong microseisms.
30d.	iPNZ iPR ₁ SKKS S PS PPS iSR ₁ SR ₂ iLNZ MEZ	15 20 02 23 50 31 16 31 32 32 40 33 16 37 52 41 40 51 16 59 20	98, compression, probably near Aleutians. ? SKS in or too near hour gap. 28 second period, become very large on N. 20 " " , smaller than L on E.

3rd QUARTER
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.

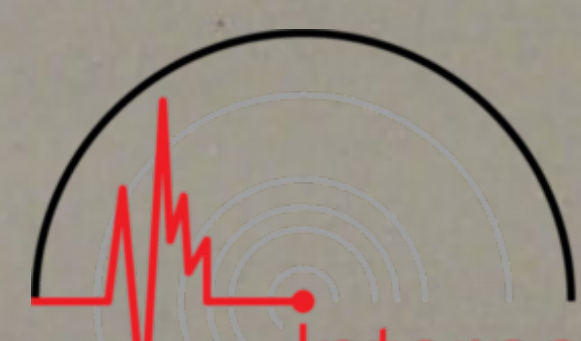
Station.	Position.		Height above M.S.L.	Lithologic Foundation.	Observer.
	Latitude.	Longitude.			
Wellington ..	41° 17' S	174° 46' E	Feet. 401	Greywacke ..	Dominion Observatory, Central Station.
East Cape ..	37° 40' S	178° 35' E	505	Upper Miocene rocks	Lighthouse-keeper.
Arapuni ..	38° 5' S	175° 39' 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).

Instruments and constants:-

Milne-Shaw	(N-S)	Pend period = 10.1 sec;	damping 20.1	(1936 July 16)
"	(E-W)	" " = 9.7 "	" " = 20.1	(1936 July 14)
Wood-Anderson	(N-S)	" " = 0.49 "	" " = 9.1	(1936 May 20)
Galitzin-Wilip	(Vertical)	" " = 7.0 "	$\mu = +0.43$	
Galvanometer		" " = 10.6	$\frac{Ak}{L} = 160$	



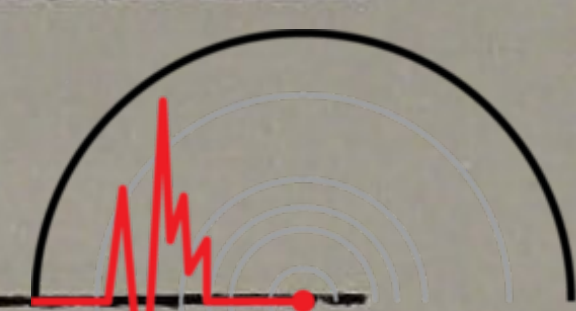
International
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Centre

All seismographs have magnetic damping.

The constants of the Galitzin-Wilip seismograph are unreliable on account of the difficulty in maintaining a sufficiently long pendulum period.

DATE 1936	PHASE	G.M.T. h ms s	Period (sec.)	Distance (deg)	REMARKS.
July 3	P PP S iSS? Lq? Lr? M	3 5 21 6 43 10 44 12 30 15 34 18 21 19	17 16	33.5	
5	eP i i i i i eL M ₁ M ₂	19 4 24 8 44 14 26 16 1 19 24 20 21 22 41 27 37	30 16		Phases masked by strong microseisms.
8	eL	22 46			Tremors.
9	P S i i	2 7 0 22 24 44		1.9	
9	P S i	10 21 47 22 38 23 0		4.5	Felt over most of the North Island, and in the northern half of the South Island, max.R-F 6. Epicentre 40.7 S, 179.4 W. Deep focus.
9	P S	15 47 22 30		0.7	Felt about Cook Strait, max. R-F 3.
9	P S	15 51 8 16		0.7	
10	P? S eL	22 57+ 58 12 59			P indefinite.
12	P eS L M	2 46 55 51 27 53 54 55		26.1	
12	P S	23 19 10 31		1.8	Followed by train of irregular waves. Felt at Dannevirke, R-F 3.

DATE 1936	PHASE	G.M.T.			PERIOD (sec)	DISTANCE (deg)	REMARKS
		h	m	s			
July 13	P	11	25	16		89.8	Focal depth 70-80 km. Very large amplitude.
	pP			33			
	i	26	13				
	PP	28	59				
	i	30	20				
	PPP	31	24				
	SKS	35	44				
	S	36	8				
	PS	37	31				
	PPS?	38	39				
	SS	42	14				
	Lq	46	0				
	Lr	50	20	30			
	L	54	5	30			
M ₁	55		25				
M ₂	12	3	17				
13	P?	23	56	48		1.2?	
	S		57	1			
14	eP?	9	53	20			
	eL		57				
14	eL	22	39				Tremors.
15	eL	10	55				Tremors.
15	P	11	20	44		26.3	Confused with previous shock
	PP		21	34			
	S		25	16			
	L		28	35			
	M		30		12		
15	P	17	51	36		0.9	Felt about Cook Strait, R9F 3.
	S			46			
16	P	0	22	59		1.8	Felt at Collingwood, R-F 2.
	S		23	20			
16	P?	13	18	32			Felt in southern Hawke's Bay,
	i			54			R-F 4.
	i	19	0				
20	eL	1	47				Traces. Records disturbed by microseisms.
21	P?	0	4	15		19.2	
	S		7	44			
	eL		9	9	22		
21	P	19	31	9		1.2	
	S			23			
22	eL?	6	30		15		
23	P	6	18	35		45.0	
	eS		25	14			
	eSS		28	19			
	iSSS		29	34			
	L		31	26			
	M		32		17		
24	P?	18	42	0		2.4?	Felt at Collingwood, R-F 4.
	i			6			
	S			27			



DATE 1936	PHASE	G.M.T.			PERIOD (sec)	DISTANCE (DEG)	REMARKS	
		h	m	s				
July 26	P	7	50	1		85.4	Large	
	S	8	0	28				
	ScS			59				
	PPS?	2	0					
	eSS	7	9					
	Lr?	14	35					
	L	19						25
M	20			20				
28	P	5	28	51		37.4		
	eS?	34	39					
	iSS	38	24					
	eL	43	40					20
	M	47						16
28	iP	8	2	50				
	eL	17	46					20
	M	22						18
30	eP?	14	3	27				
	eL	16	6					
	M	17						22



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In addition, small local tremors were recorded as follows:-

July 3d 7h 33m; 5d 18h 31m; 13d 3h 4m; 13d 9h 13m; 14d 4h 59m;
14d 13h 4m; 14d 15h 11m; 16d 7h 29m; 16d 14h 58m; 17d 11h 56m;
18d 0h 7m; 22d 5h 41m; 22d 19h 33m; 27d 23h 17m; 31d 2h 40m.

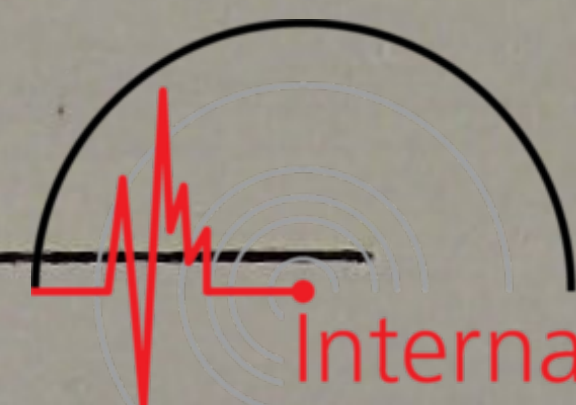
A R A P U N I.

Milne Seismograph, E-W compt., undamped; Pend-period = 25 sec. (1936 July,)
Magnification = 5.6

DATE 1936	PHASE	G.M.T.			Period sec.	Distance deg.	REMARKS
		h	m	s			
July 3	eL	3	14.6				
5	S	19	15.2				
	SS		18.8				
	L		22.5				
	M		31				
9	i	10	21(20)				
	S?		55				
12	S	2	51.7			Tremors.	
13	SKS	11	35.8				
	eS		36.1				
	iPS		38				
	iPPS		39.5				
	iSS		42.6				
	Lq?		46.2				
	Lr		50				
	L		53.3				
M		57				May be SSS	

(5)
T U A I

Milne-Jaggur Seismograph.



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Date 1936	phase	G.M.T. d h m	Period sec.	Distance deg.	Remarks
July 9	P S?	10 21 (0) 30		2.6?	
9	P?	11 7			Possibly not seismic.

N E W P L Y M O U T H

Station (a) Wood-Anderson Short-period Seismograph.
" (b) Milne-Jaggur Seismograph.

Date 1936	phase	G.M.T. d h m	Period sec.	Distance deg.	Remarks
July 8		21 14			Local tremor.
9		2 7			" "
9		4 45			" ", possibly not seismic
9	P i?	10 22 (0) 38			Faint record.
9	P S?	15 51(50) 52 11		1.8?	
10	P S	4 28 (0) 4		0.4	
10	eS?	22 58 7			Tremors.
12	S eL	2 51 (0) 53 20			
12	P S	23 19(49) 20 3		1.2	
13	S? Lq L M ₁ M ₂	11 35(40) 46 54 56 12 7	25 20 16		May be SKS
14	P S i	5 8 (0) 3 10		0.3	
15		17 51			Local tremor.
24	P? S i	18 42(10) 31 37			
27		5 37			Local tremor.

STRATFORD

Milne-Jaggard Seismograph.

A local tremor was recorded on July 9d 10h 21m.



HASTINGS

Milne-Jaggard Seismograph.

Date 1936	Phase	G.M.T. d h m	Period sec.	Distance deg.	Remarks.
July 8		2 21 (30)			Local tremors.
9	P S i	10 21 (30) 22 4 56		3.0	
12		23 19			Local tremor.
13		1 39			" "
13		2 23			" "
16	P? S	13 18 (0) 2		0.3	
24		14 36			Local tremor.
25		20 8			" "

TAKAKA

Milne-Jaggard Seismograph (commenced recording on July 18th).

Small local tremors were recorded :-

July 27d 13h 50m; 27d 15h 10m; 28d 19h 30m; 29d 5h 40m.

CHRISTCHURCH (MAGNETIC OBSERVATORY)

(Local Earthquakes) .⊕

Wood-Anderson Short-period Seismograph; magnetic damping.

Pend. period = 0.8 sec; damping = 0.85.

Date 1936	Phase	G.M.T. d h m	Period sec.	Distance deg.	Remarks.
July 9	P S	10 22 17 23 30		6.5	
9		15 48 28			Local tremor.
9		19 37			" "
12		23 20			" "
13		23 57			" "
15		17 52			" "

⊕ For readings of distant earthquakes, see Provisional Report of the Magnetic Observatory on page 27.8.

Milne-Jaggard Seismograph.

A local tremor was recorded on July 27d 0h 50m;



CHATHAM ISLANDS

Milne Seismograph; NE-SW compt., undamped, Pend-period = 10 sec.
(1936 June); magnification = 6.

Date 1936	Phase	G.M.T. d h m	Period sec.	Distance deg.	Remarks.
June 10	eP eS L? M	8 (31.0) 37.6 43 44			
22	eL?	8 45			Tremors.
22		11 4			Feeble tremors.

N O T E S

The seismograph at EAST CAPE was not operating during the month owing to extensive repairs to the clock.

After overhaul to the clock, the seismograph at BUNNYTHORPE commenced recording on July 13th. No earthquakes were recorded there up to July 31st.

At GREYMOUTH no earthquakes were recorded during the month.

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

Origin Time (G.M.T.) 1936 d h m	Provisional Epicentre		Focal Depth.	Remarks.
	Lat. (deg)	Long. (deg.)		
June 10 8 23	7 S	147 E	Deep	Epicentre from Riverview, Manila, Apia, Wellington, Christchurch, (from data in seismological reports).

The Acting-Director of the Dominion Observatory gratefully acknowledges receipt of the following seismological publications received during the month of July 1936:-

International Seismological Summary	-- 1931 April-June.
Schweizerisches Erdbebenbulletin	-- No. 71, 1936 April.
Perth.	-- 1936 Nos. 7, 8.
Nagasaki	-- 1935 November-December.
Praha	-- 1936 Jan.-March.
San Fernando	-- 1936 March, April.
Phu-Lien	-- 1935 November.
Madagascar	-- 1935 October-November.
Riverview	-- 1936 June.
Taihoku (preliminary)	-- 1936 May.
Schweizerisches Erdbebenbulletin	-- 1936 May.
Zi-Ka-Wei	-- 1935 Nos. 20-23, 1936 Nos. 1-4.
Apia	-- 1936 April-June.

U.S. Coast and Geodetic Survey
 Jesuit Seismological Association
 New
 Ottawa
 Strasbourg
 Parc Saint-Maur
 Hambourg
 La Plata
 Union Geodesique et Geophysique Internationale
 Phu-Lien
 Vladivostok
 Chiufeng
 Zi-Ka-Wei
 Sydney
 Manila
 Kobe
 Tyosen

--1935 January-June.
 --1936 April (Preliminary)
 9-1935 May.
 --1936 May.
 --1936 April.
 --1936 April.
 --1936 January, May.
 --1936 April;
 --1936 April.
 --1935 December.
 --1936 January-March.
 --1936 May.
 --1936 May (Preliminary).
 --1936 June
 --1936 May
 --1935 January-March.
 --1935 Oct.-1936 March (Preliminary)



MAGNETIC OBSERVATORY, CHRISTCHURCH

PROVISIONAL EARTHQUAKE BULLETIN, JULY 1936.

Date	Phase	G.M.T.	Distance in degrees - remarks.
3d.	iP	3.05.37	31.3 Compression.
	iSE	10.51	
	LE	13.55	
	LN	14.09	
	ScS	16.05	
	MEZ	16.53	
5d.		19.29.23	ca. Some surface waves in large mic'sms.
9d.	iP	10.22.17	6.6, compression, deep, Az.20.
	iS	23.32	followed by gradually returning one-sided movement as if tilted to S & E which is opposite to that of similar shock May 23rd.
11d			Slight seismic activity began 21.51 ca.
121.	P	2.48.07	Compression 22.5, probably N.N.W.
	S	52.12	
	L	53.55	
	M	55.28	
13d.	eP	11.25.17	75.0, compression, multiple shock?
	iP	25 30	Following amplitude very large on Z & E P ₂ ? or deep reflection.
	iNEZ	28 59	P ₂ R ₁ ? reflected Austarian continent?
	iS	34 58	not very prominent, SV on E component.
	iNEZ	35 44	ScS?
	iNZ	36 10	
	iZ	37 30	Horizontal traces become too involved.
	SR2	42 45	Large on E.
	L	49 24	
	iMNZ	54 14	Amplitudes became very large, slightly earlier already too rapid to shot on E.
14d.	eP	9.50.46	29.6, phases difficult to detect readily in irregular microseisms.
	eS	55 48	
	L	58 53	
	M	01 26	
15d.	ePZ	10.50.03	86.7, compression? in microseisms.
	PR1	53 24	
	PR2NE	55 13	
	PR3	57 09	
	iE	00 05	SKS? definite wave.
	S	00 42	
	PcSScPNE	05 00	
	SR1	06 37	

Date	Phase	G.M.T.	Distance in degrees - remarks.
	SR2NE	10 30	
	SR3E	13 17	
	M	24 19	Sharp impulses on N and E.
22d.	eP	6 11 51	64.6, doubtful, microseisms strong.
	eS	20 37	
	LE	31 19	
	MNZ	35 45	
23d.	iP	6 16 49	51.2, compression, N.W. Az.
	eS	24 12	
	iNE	30 21	Sharpest on N, SR3? reflected from ridge through Lord Howe Island?
	LE	33 00	
	MNZ	36 47	
26d.	iP	7 50 02	82, dilation, probably S Atlantic.
	eSNE?	9 00 18	
	iS	00 34	
	iPSE	01 03	Largest amplitude group on E follows. 16 second period.
	eSR1N	05 44	
	eE	07 12	
	SR2N	09 41	
	G	15 30	Nomenclature of Gutenberg & Richter, 40 second period.
	iLNEZ	19 05	28 second period.
	M	23 34	
27d.	eP?	8 55 37	compression? small in microseisms.
	SE?	9 05 23	
	GE	19 51	
	M	27 39	
28a.	iPZ	5 27 06	41.7, compression.
	eS	33 30	
	GN?	36 30	
	LE	39 34	
	MNZ	43 08	
28d.	iP	8 01 20	41.2, sharp compression, probably N.N.W.Az.
	iPcPZ	02 57	Small.
	ePcS	07 25	
	iS	07 41	
	GN?	10 47	Long period shallow.
	iE	12 24	
	LE	13 47	
	MNZ	18 31	
30d	GN	14 14 40	small masked by microseisms.
	L	17 55	
	M	21 50	

ROSENEATH

(Private Station)

Lat. 41° 17' S : Long 174° 48' E.

INSTRUMENT : Milne-Jaggard Seismograph.

OBSERVER : L. Bastings, D.Sc.

On July 9d 15h 46m 48s a local shock was recorded, with (S-P) = 6 secs.



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.

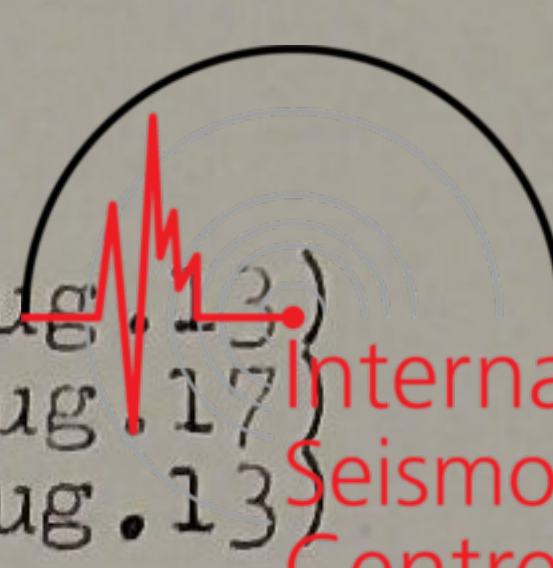
* Privately-owned station.

[1,500/6/36—3636

WELLINGTON (DOMINION OBSERVATORY).

Instruments and constants:-

Milne-Shaw	(N-S)	Pend period = 10.4 sec;	damping 20.1	(1936 Aug. 13)
"	(E-W)	" " = 10.6 "	" 20.1	(1936 Aug. 17)
Wood-Anderson	(N-S)	" " = 0.55 "	" 9.1	(1936 Aug. 13)
Galitzin-Wilip	(Vertical)	" = 18 7.0 "	$\mu = +0.43$	$\frac{Ak}{\pi l} = 160$
Galvanometer	"	10.6		


 International
Seismological
Centre

All seismographs have magnetic damping.

The constants of the Galitzin-Wilip seismograph are unreliable on account of the difficulty in maintaining a sufficiently long pendulum period.

DATE 1936	PHASE	G.M.T. h m s	PERIOD (SEC.)	DISTANCE (DEG)	REMARKS
Aug. 2		12 8			Tremors from distant shock.
2	eL?	12 55			Tremors.
4	P S? i	22 4 58 5 12 14		1.2?	
11	P S	2 49 20 32		1.1	Felt at Paekakariki, R-F 3.
11	eP? S	23 49 16 57		3.6?	Probably deep focus.
12	eL	11 40			Tremors from distant shock.
13	L	20 22			Prolonged and irregular movements.
14	eL	6 14			Tremors.
15	eL	2 39 3			Tremors; records disturbed by wind.
15	eL	5 30+			Traces; records disturbed by wind.
16	i	4 37			Traces.
16	P? S L i M	13 16 30 18 14 19 5 20 5 20 30	7 10	9.3?	P very small. Felt at extreme south of New Zealand, R-F 4.
17	eL M	6 26 27	15		
17	P? S SS L M	14 7 27 13 26 16 3 20 23	15 18	38.7	P small.
17	eL	17 15			Traces.
18		7 52			Traces.
22	P S	3 10 16 47		2.7	
22	P S SS	7 3 46 13 45 19		80.8	

DATE 1936	PHASE	G.M.T.			PERIOD (SEC)	DISTANCE (DEG)	REMARKS
		H	M	S			
Aug. 22	Lq?	25			30		
	Lr?	31					
	M ₁	33			20		
	M ₂	40			20		
	W ₂ M	9+ 9 38			15		
23	P?	21 11 55			32?	Very small. Felt at Waipiro Bay and Motu, R-F 3.	
	S?	12 32					
	i	33					
	i	40					
23	P	21 24 51			81.8	Focal depth 70-80km.	
	pP	25 10					
	sP?	35					
	i	26 10					
	PP	28 8					
	S	35 4					
	ScS?	15					
	sS	36					
	i?	36 0					
	SS	40 52					
	SSS	44 29					
	L	49					
	M	22 1		24			
24	eL	11 24				Tremors.	
24	P	22 27 32			27.2	Focal depth 130km ±	
	pP	28 2					
	PP?	29 29					
	i	30 10					
	PcP	30 38					
	S	32 5		10			
	sS	55					
	i	33 20					
	i	38					
	i	50					
	M	34		14			
	L	35 12		10			
i	36 0						
ScS	38 2						
sScS	58						
25	e?	18 54 41			14		
	L	55 22					
	e	57 5					
	i	59 21		10			
M	19 1						
26	P	11 29 29			3.5	Felt at Hastings and Danne- virke, max. R-F 5.	
	S	30 9					
28		7 0				Deep focus. Tremors; records disturbed by microseisms.	
28	P?	13 33 36			1.2?	P very doubtful.	
	S?	50					
28	P	19 28 52			1.6?		
	i	29 3					
	S?	10					
i	12						
29	P?	4 40 58			0.3?		
	S	41 1					





DATE 1936	PHASE	G.M.T.			PERIOD (SEC)	DISTANCE (DEG)	REMARKS
		H	M	S			
Aug. 31	S	5	45	21		Local	
31	eP	11	32	6	0.4		
	S			10			
	i			12			

In addition, small local tremors were recorded as follows:-

Aug. 11d 9h 52m.; 13d 5h 6m.; 15d 17h 11m.; 16d 10h 29m.; 24d 5h 59m.;
24d 16h 6m.; 27d 12h 6m.

A R A P U N I.

Milne Seismograph, E-W compt., undamped; Pend-period = 24 sec. (1936 August)
Magnification = 5.6

DATE 1936	PHASE	G.M.T.			PERIOD (SEC)	DISTANCE (DEG)	REMARKS
		H	M	S			
Aug. 16	L	13	21				
	i			23.5			
17	S	14	13	(0)			
	SS?			16.8			
22	S	7	(13.8)				
	SS			19.4			
	Lq			25.0			
	M			34			

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

Station (a) Wood-Anderson Short-period Seismograph. E-W component.
" (b) Milne-Jagggar Seismograph.

Local tremors were recorded at station (a) on August 20d 0h 27m.

H A S T I N G S.

Milne-Jagggar Seismograph, NE-SW component.

DATE 1936	PHASE	G.M.T.			PERIOD (SEC)	DISTANCE (DEG)	REMARKS
		H	M	S			
Aug. 10	P	12	53	(30)	0.3		
	S			32			
	i			43			
26	P?	11	30	(0)	1.4?		
	i			9			
	S			14			
	i			16			
	i			21			
	i			24			

T A K A K A.

Milne-Jagggar Seismograph, E-W component.

A local tremor was recorded on August 14d 20h 15m.

CHRISTCHURCH (MAGNETIC OBSERVATORY).

(Earthquakes within about 10° only. For more distant earthquakes see special report from Magnetic Observatory on p. 6).

Wood-Anderson Short-period Seismograph; Magnetic damping.
Pendulum period = 0.8 sec., damping = 0.85.



DATE 1936	PHASE	G.M.T.			PERIOD (SEC)	DISTANCE (DEG)	REMARKS
		H	M	S			
Aug. 13	P S	20	0	31 39		0.7	
16	P? i i i	13	16	12 27 33 59			
18	i i	0	21	12 17			Small.

M O N O W A I.

Milne-Jaggard Seismograph; E-W component.

DATE 1936	PHASE	G.M.T.			PERIOD (SEC)	DISTANCE (DEG)	REMARKS
		H	M	S			
Aug. 16	S? i i i	13	15	(0) 2 18 25			

N O T E S (1936 August).

No earthquakes were recorded during the month at TUAI, STRATFORD, BUNNYTHORPE, ROSENEATH, and GREYMOUTH.

The seismograph at EAST CAPE was out of action during the first part of the month, but the repairs to the clock have been completed.

The Wood-Anderson seismograph at Christchurch was out of action after 18th owing to repairs to the clock.

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

ORIGIN TIME (G.M.T.) 1936	D	H	M	PROVISIONAL EPICENTRE		FOCAL DEPTH	REMARKS
				LAT. (DEG)	LONG. (DEG)		
JULY	3	2	58	10 S	160 E	Normal	Epicentre from Riverview, Christchurch and Wellington. Felt over a large part of New Zealand, max. R-F 6. Epicentre from Manila, Riverview, Adelaide and Christchurch.
	9	10	21	40.7 S	179.4 W	Deep	
	28	5	17	5 S	140 E	Normal	

The Acting-Director of the Dominion Observatory gratefully acknowledges receipt of the following publications received during the month of August, 1936:-

Taihoku	1936, June (Preliminary).
Hong Kong	1936, June (Preliminary).
Uccle	1936, Jan.-Mar.
Batavia	1936, Jan.-Mar.
Adelaide	1932 July-Dec., 1933 Jan.-Dec.
Kobe	1935, Apr.-June.
Jesuit Seismological Station	1936, May (Prelimin. 1935 Aug. 25. (Prelimin.))
Pasadena	1936 April
Florissant	1935 Dec., 1936 Jan., Feb.
Adelaide	1936 July.
Ksara	1936 May.
Saint Maur du Parc.	1936 May.
Strasbourg	1936 May.
Bureau Central Seismologique Francais.	1936 May.
Union Geodesique et Geophysique Internationale	1936 May
Kew	1936 June.
Copenhagen	1933 Jan.-Dec.; Dec 1933-June 1934.
Lund	1934 July-Sept.
De Bucarest	1932 Jan.-Dec.
Gottingen	1936 April, May, June.
Toronto	1935 Apr.-Sept.
Perth	1936 Apr. May. June.
Schweizerisches Erdbebenbulletin	1936 May June.
Florissant	1936 June.
Saint Louis	1936 March.
Riverview	1935 Aug.-Oct.
Vladivostok	1936 July.
Ksara	1936 April.
Hong Kong.	1936 June.
Chiufeng	1936 June.
Melbourne	1936 June.
Zi-Ka-Wei	1936 Apr. May June.
Espana ; Boletin mensual de las observaciones sismicas. Nos. 124, 125.	1936 June (Preliminary).
Manila	1936 June, July (Preliminary).



MAGNETIC OBSERVATORY, CHRISTCHURCH.

PRELIMINARY EARTHQUAKE BULLETIN, AUGUST, 1936.

The following Report has been prepared by the Director of the Magnetic Observatory, Christchurch:-

DATE	PHASE	G.M.T.	Distance in degrees - remarks.
1936 Aug. 12d.		6.33 ca.,	slight seismic activity, in microseisms.
" 13d.	eL eM	11 39 41 41 41	earlier movements masked by "
13d	eP S SR1N GN? LE MNZ	20 13 37 22 23 26 47 29 39 34 47 38 11	64.6 indefinite on E.
14d		6 16.16 ca.	slight seismic activity.
15d.	LE MNZ	2 38 50 41 18	slight seismic activity.

DATE	PHASE	G.M.T.	Distance in degrees - remarks.
1936 Aug. 15d.	eNE eZ	5 40 15 ** 44 00	long period, shallow. followed by shallow waves.
16d.		4 38 ca.	slight seismic activity commenced.
16d.	eP	13 15 57	6.5? pulsation superimposed on 20 second waves.
	iN	17 12	
	eZ	17 12	
	iZ	17 19	small
	iNE	17 29	followed by large amplitudes.
	iE	18 07	beginning max. amplitudes.
	iNZ	19 57	max. amplitudes.
17d.	ePZ eSE LNE M	5 19 50 24 15 26 34 28 38	24.7
17 d	eP eS SR2 LE M wMEZ	14 01 45 8 55 13 33 16 53 21 10 16 40 30	49.1, in microseisms.
17d.	eNE eZ	17 14 12 17 18	Long period, shallow.
22d	iPZ iSE eSNZ SR1 SR2E GN LN LEZ M	7 03 51 13 52 13 52 19 11 22 27 24 39 29 21 30 37 35 39	78.9; compression, times uncertain. clock adjusted.
22d	w1LN w1LEZ w1M	9 06 11 10 05 25 19	small. " largest on E & Z.
23d	iPZ iPE iPN eE iSZ SNE SR2E SR1 eE eLN iLN eLEZ MEZ	21 25 00 25 04 25 06 34 12 35 00 35 03 43 26 40 22 44 34 49 42 50 42 53 12 55 22	78.7, compression. 25 second period, regular. Amplitudes become large. long period.
24d	eP eS L M	11 21 32 24 35 25 23 26 46	15.7
25d		16 41 ca.	slight seismic activity.
25d	eP? eS eLE MNZ	18 32 39 42 09 54 51 19 00 29	72.8 in microseisms.



DATE	PHASE	G.M.T.	Distance in degrees-remarks.
1936			
Aug. 26d	P?	21 43 17	In microseisms.
	eL	52 11	
	MNZ	54 45	



28d 7 00 ca. seismic activity in very large microseisms.

CONSTANTS

	$K_A T/4\pi l$	T. (pend.) secs.	T_1 (Galv.)	$\frac{2}{\mu}$
E	300	24.25	24.4	+ .03
N	300	23.6	23.6	+ .019
Z	300	12.82	12.86	- .014.

As from 26th August, 1936.

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

- Pasadena, March, April, 1936.
 - Florissant, 1935, pp. 20. 34, 1936 pp. 1-7
 - Sydney, 1936 April-June.
 - Tokyo E.R.I., 1935 Part 4, & Vol. XIV part 2.
 - Apia 1936, April-June.
 - J.S.A., Central Station, 1936, pp 3-9, 1935 pp 20a.
 - Hamburg, 1936, pp. 1-9
 - Academia Sinica, Vol.4, Nos.3.
 - Batavia, Jan-Mar., 1936.
 - Saint Louis, 1935, pp 14-22
 - Melbourne, Bulletin No.34.
-

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)



Instruments and constants :-

Milne-Shaw (N-S) Pend period=10.4 sec; damping 20:1 (1936 Aug.)
 " " (E-W) " " =10.6 " " " 20:1 " "
 Wood-Anderson (N-S) " " = 0.55 " " " 9:1 " "
 Galitzin-Wilip (Z) " " = 7.0 " $\mu = +0.43$ $\frac{Ak}{1} = 160$

All seismographs have magnetic damping.

The constants of the Galitzin-Wilip are unreliable.

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (deg)	Remarks
Sept. 3	i? L M	12 34 58 39 40	17-20		Strong microseisms.
4		8 52			Traces.
4	P? sP? S i i i	10 50 8 10 22 31 33 45		1.2?	Felt in north-western part of South Island, max.R-F 6. Approximate epicentre 40.3 S, 173.5 W.E
5		5 12			Traces.
5	P S i	10 35 52 36 11 17		1.7	
5	e i? e? i L M	17 29 37 35 24 54 36 30 41 45	10		
5	eP? S i? i?	17 42 56 43 10 11 16		1.2?	Felt at Takaka.
5		22 17 19			Tremors.
5	P? S?	22 45 53 57		0.4?	
6	P? S L i M1 M2 M3 M4	17 48 13 49 35 50 52 5 52+ 55 56 57	15 10 12 15	$\approx 7.3?$	Interpretation doubtful.
8	P S? i i	2 14 45 46 48 51		0.1?	

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (deg)	Remarks
Sept 8	P S	9 26 25 26		0.1	
8	L	15 50			Prolonged tremors.
8	eL	16 24	17		" " " "
9	P S? i	7 45 17 18 20		0.1?	
10	P? S?	3 1 6 8		0.2?	
11	P? S?	15 47 10 11		0.1?	
12	P S	1 14 50 54		0.4	
12	P S	1 16 32 37		0.5	
12		4 32			Tremors.
12	P S	4 30 43 47		0.4	
12	L	8 21 20			Tremors.
14	P S	3 43 21 44 1		3.5	Approximate epicentre, 38.3 S, 177.2 E. Deep focus
14	P? S	23 55 25 29		0.4?	
16	eL i M i	9 33 34 1 35 14 56	20 16?		Very irregular tremors in strong microseisms.
17		3 32			Tremors; records distur- bed by strong microseisms. Traces.
17		10 43			
17	i i i i M1 M2	17 18 37 53 19 55 20 44 23 25	8		
18	P S i L M	17 43 18 44 36 41 45 8 48 16	15	9.4	
18	i i	18 6 30 11 0			Tremors.



Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (deg)	Remarks
Sept. 19	i S SS? SSS Lq? Lr? M1 M2 M3	1 15 25 24 28 31 0 37 40 20 44 46 48 52	25 25 22 20		Records disturbed by strong microseisms.
19	P S	7 15 19 25		0.5	
21	P? S? eL M	16 35 19 38 59 42 46	14	20?	
22	P S?	5 7 13 28		1.3?	
23	L	6 52	13		Prolonged tremors.
24	P i S?	11 33 19 45 47		2.5?	Felt at Raetihi and Oha- kune.
25	L i M	13 41 43 30 44			Tremors.
26	eP i S	6 3(41) 59 4 2		1.8	Time marks failed.
26	P? S	17 21(36) 22 6		2.6?	
28	P? S	23 53 11 15		0.4?	
29	P PP PPP S L M	16 40 23 36 41 8 44 4 45 50 47	21	20.5	
30	P S	9 58 15 26		1.0	

In addition, small local movements were recorded as follows :-

Sept. 2d 4h 51m; 7d 22h 52m; 10d 5h 49m; 10d 19h 23m; 11d 2h 27m;
11d 16h 57m; 15d 2h 36m; 28d 1h 41m

(5)

A R A P U N I

Milne Seismograph, E-W compt., undamped; Penā.period=24sec.(1936 Sept.)
Magnification=5.6



Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (deg)	Remarks
Sept. 6	eP?	17 47.2		6.4?	
	S?	48.4			
	M	49			
	i	49.5			
	i	50.2			
14		12 11			Tremors.
19	SS?	1 30			
	SSS	37			
	Lq?	39.5			
	i	42.7			
	Lr?	46.4			

T U A I

Milne-Jaggat Seismograph; E-W compt.

Faint tremors were recorded on Sept.14d 3h 50m.

N E W P L Y M O U T H

Station (a) Wood-Anderson Short-period Seismograph; E-W compt.
" " (b) Milne-Jaggat Seismograph.

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (deg)	Remarks
Sept. 4	P	10 50 (0)		0.6?	
	S?	7			
13	P	22 8 43		0.6	
	S	50			
14	P	3 43 7		2.6	
	S	37			
18	P	20 50 46		1.4	
	S	51 2			
22	P	5 19 40		0.4	
	S	44			

In addition, small tremors were recorded as follows :-

Sept.4d 20h 59m; 12d 1h 15m; 12d 19h 35m?; 14d 20h 34m; 15d 6h 9m;
15d 11h 11m; 15d 20h 57m; 18d 17h 42m; 18d 18h 4m; 19d 0h 14m;
19d 1h 46m; 19d 10h 23m; 22d 21h 30m; 24d 20h 39m.

(6)

S T R A T F O R D

Milne-Jaggur Seismograph; E-W compt.

A small tremor was recorded on Sept. 8d 8h 1m



H A S T I N G S

Milne-Jaggur Seismograph; NE-SW compt.

Local tremors were recorded as follows :-

Sept. 14d 19h; 18d 0h 39m.

T A K A K A

Milne-Jaggur Seismograph; E-W compt.

Sept. 4d P= 11h 18m (0)s
S= 10

Small tremors were also recorded as follows :-

Sept. 5d 17h 44m; 12d 2h; 12d 3h (three shocks); 12d 4h (three shocks);
12d 6h.

C H R I S T C H U R C H (M A G N E T I C O B S E R V A T O R Y)

(Earthquakes within about 10° only. For more distant earthquakes, see special report of Magnetic Observatory on page 8)

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

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (deg)	Remarks
Sept. 2	P i S i i	4 50 50 55 58 51 1 9		0.7	
3	i i	14 13 18 22			
4	P? i i	10 50 39 53 51 9			
8	S? i	1 15 39 40			
13	i i	21 38 11 15			
14	i i	3 45 7 12			
26	P i S	6 3 41 4 1 5		2.1	



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

PROVISIONAL EPICENTRES IN NEW ZEALAND AND
SOUTH-WEST PACIFIC, 1936 ~~XX~~ AUGUST.

Origin Time (G.M.T.)	Provisional Epicentre		Focal Depth	Remarks
1936 d h m	Lat. (deg)	Long. (deg)		
Aug.17 14 0	12 S	158 E	Normal	Epicentre from Riverview, Adelaide, Wellington.

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological bulletins, received during the month of September 1936 :-

Sydney, 1936 July
Ottawa, 1936 June, July
United States Bureau of Mines
1936 June.
Jesuit Seismological Association,
1936 June-July (Prelim.)
Saint Louis, 1935 Nov.-Dec., 1936 Jan-May.
Hongkong, 1936 July (Preliminary
and monthly).
Adelaide, 1936 August (Prelim).
Denver, 1935 Jan-Dec.
Chiufeng, , 1936 July.
Taihoku, 1936 June (Prelim.) July
Rathfarnum Castle, 1936 Apr-June
Florissant, 1936 Apr-May.
Kew, 1936 July.
Schweizerisches Erdbebenbulletin,
1936 July (number 74)
Union Geodesique et Geophysique
Internationale, 1936 May, June.
Bureau Centrale Seismologique
Francais, 1936 June.
Parc Saint-Maur, 1936 June
Universite de Strasbourg, 1936 June
La Plata, 1936 May-June.
San Fernando, 1936 May, June.
Berkeley, 1935 Apr-Sept.
Mount Hamilton, 1935 Apr-Sept.
Palo Alto, " " "
San Francisco, " " "
Ferndale, " " "
Uccle, 1936 number 2.
Phu-Lienm, 1936 Jan-Feb-Mar.
Reseau Seismique de l'URSS, 1935 Apr-Dec.
Perth, 1936 number 11
Riverview, 1936 August
Manila, 1936 July, August (Prelim)
Georgetown Seismological Despatches, 1936 April-July.
Pasadena, 1936 May.

MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN-SEPTEMBER 1936

(Prepared by the Director of the Magnetic Observatory)

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS.
Sep. 3d.	eP?	12.21.57	45.6?, in strong microseisms.	
	eS?	28.45		
	eLN	34.53		
	MEZ	38.42		
4d.		8.50ca		Slight seismic activity in strong micros'ms.
5d.	eP?	4.43.21	78.0?, small, in microseisms.	
	eS	53.17		
	LE	5.07.38		
	M	13.51		
5d.	eP?	17.06.45	78.0, do.do.	
	eS	16.41		
	eL	31.27		
	eM	38.35		
6d.	iPZ	17.44.46	23.3, dilatation, in strong microseisms.	
	PcPN	48.37		
	iS	48.59		
	LE	50.46		
	iMNZ	52.24		
7d.		6.58ca.		slight seismic activity began.
7d.	PZ	12.29.11	78.2, phases small and doubtful.	
	SEZ	39.08		
	MNZ	13.00.05		
8d.	eE	15.48.46	30 second period.	
	eZ	50.46		
	F	15.57ca.		
8d.	iEZ	16.16.24	26 second period.	
	eEZ	24.54		
	eN	26.45		
	F	16.52ca.		
16d.	PN.	1.11.28	23.2, in strong microseisms.	
	S	15.40		
	LE	17.44		
	M	19.52		
16d.		4.57ca.		Small surface waves in strong microseisms.
16d.	eLE	9.33.37	In strong microseisms.	
	MNZ	35.55		
19d.	iPEZ	1.13.55	From W?, small compression, then larger dil., S emergent on E. 82.8	
	iSNZ	24.15		
	SRI	29.55		
	LN	37.15		
	M	44.10		largest on E.
	mEZ	1.50ca.		Very large amplitudes begin.
19d.	PZ?	6.37.54	Compression, in microseisms, 98±?	
	L	7.11.58		
	M	18.54		largest on E.

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS
Sept. 19	P	16.36.21	17.6	Compression
Sept. 21d	P	16.36.21	17.6	
	iSN	39.43		
	LE	41.05		
	MNZ	42.57		
23d	eNE	6.48.06		Shallow waves.
	eZ	52.50		
	F	7.25ca.		
25d.	P	13.16.42		67.0, doubtful, in microseisms.
	eS	25.40		
	eLN	38.20		
	MEZ	43.30		
29d.	P	16.40.57		21.2, compression?
	S	44.41		largest on E.
	LN	46.22		
	MEZ	48.05		



4th QUARTER
1936

Bulletin E 55

OCT 1936

DEPARTMENT OF SCIENTIFIC AND INDUSTRIAL RESEARCH.



DOMINION OBSERVATORY, WELLINGTON, NEW ZEALAND.

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(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. Hayward

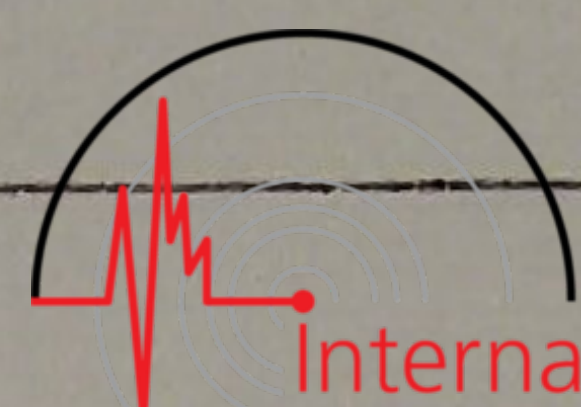
Instruments and constants †;

Milne-Shaw (N-S) Pend. period = 9.8 sec. Damping 25:1 (1936 Oct.)
 Milne-Shaw (E-W) " " " = 9.1 " " 20:1 " "
 Wood-Anderson (N-S) " " " = 0.55 " 9:1 " Aug.
 Galitzin-Wilip (Z) " " " = 7.0 " $\mu = +0.43$ $\frac{\Delta k}{\pi I} = 160$

All seismographs have magnetic damping.

The constants of the Galitzin-Wilip are unreliable.

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (deg)	Remarks
Oct. 3	P?	22 00 38	15-30 20	85?	Period changes from 15 to 30 sec. in 2 mins.
	S	09 17			
	Lq	23 32			
	M	29			
4	P	23 56 36		11.2	Wood-Anderson record. Epicentre 33°S, 175°W Deep focus.
	i	49			
	i	57 01			
	i	25			
	i	58 19			
	S	42			
	i	44			
	M1	49			
5	M2	59 2		2.7?	Wood-Anderson records
	i	12			
	i	42			
	P?	0 54 11			
	S	42			
5	M1	44			Times approximate owing to failure of time marking.
	M2	46			
	i	49			
6	i	52			
	P	9 55 (0)			
6	S	10 03 10			
	M	13			
6	P	3 19 36		0.9	
	S	46			
6	P	20 07 16		1.4	
	S	07 32			
6	P	20 40 38		2.5	
	S	41 06			
10	P	17 40 15		1.3	Probable epicentre 42°S, 172°E.
	S	30			
11	P	1 01 04		2.1	Probable epicentre 42°S, 177°E.
	S	48 2			
11	P?	3 12 38		0.5?	
	S	44			
11		12 37			Surface waves.
12		7 04			" " "



Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (degrees)	Remarks
Oct. 12		12 41			Surface waves.
13		7 12			Traces.
14	i i M	22 20 22 26 18 27	22		
16	e? i L M	12 10 12 13 35 16 26 20 40	23 16		
18	P i S	9 41 45 49 42 09		2.2	Felt at Nelson, Westport, Murchison. Epicentre near 40°7S, 172°0E.
19	P S	4 4 40 51		1.0	
19	P S SS SSS L M	12 14 16 22 22 26 48 28 29 31 37	30	59	
22		16 24			Traces.
23	L M1 M2 M3	7 15 17 23 31	25 20 17		
23	L M	8 35 57	17		
23	L M	19 45 50	17		
23	S	21 37 48			Local; P lost in changing paper.
24	P i S	5 37 05 11 19		1.2	
24	P S	15 42 44 52		1.6	
24	L M	18 10 16	13		
26	i	16 34 59			Felt at Oamaru.
26	L M	20 13 20	20		
27	P i i S i	16 13 54 59 14 06 19 30		2.2	Felt in Hawke's Bay District, max. R-F 4; also at New Plymouth, Palmers- ton North, Otaki. Epicentre 39°8 S, 175°8E.
28	i S	18 06 14 29			Felt at New Plymouth.

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (degrees)	Remarks.
Oct. 29	P	18 49 08	23 16 18	62.5	
	PP	51 38			
	S	57 35			
	SS	19 01 50			
	SSS	03 21			
	Lq	07 13			
	Lr	10			
	M	16			
30	P	11 06 09		2.1	
	S	33			
31	i	15 05 35			Felt at Napier, R-F 3.
	S	39			

In addition, small local tremors were recorded as follows :-

Oct. 11d 6h 32m; 11d 12h 41m; 15d 12h 35m; 16d 8h 21m; 17d 4h 28m;
 23d 12h 35m; 23d 12h 43m; 23d 15h 30m; 24d 16h 59m; 25d 1h 55m;
 25d 12h 13m; 26d 2h 33m; 28d 16h 40m; 31d 18h 34m.

A R A P U N I

Milne Seismograph; E-W component, undamped; Pend. period=24 sec.
 (1936 Sept); Magnification =5.6

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (degrees)	Remarks
Oct. 4	P	23 56 50		10.2	
	S	58 45			
	M	24 00 00			
5	PP?	10 03 25			P possibly lost in time gap.
	S	09 55			
	SS?	15 50			
	L	18 10			
	M	21			
19	i	12 26 30			
	L	34 30			
	M	37 30			
23	i	18 05 30			
23	i	19 46			
26	i	18 37 20			
26	eL	20 46			
	M	48			
29	S?	18 57.1			
	i	19 04.7			
	M	08			
30	i	13 41.9			
	i	42.2			
31	i	15 05.4			Local

(5)



T U A I

Milne-Jaggard Seismograph; E-W compt.

A faint tremor was recorded on Oct. 27d 08h.

N E W P L Y M O U T H

Wood-Anderson Short-period Seismograph; E-W compt.

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (degrees)	Remarks
Oct. 1	S	20 01 12			
2	S i	5 13 09 21			
4	P? i S	23 56 55 57 02 58 07		6.4?	
5	P S	16 41 29 45		1.4	
6	P S	20 41 07 15		0.7	
18	P? S	9 42 06 32		2.3?	

Note: Owing to clock trouble, records were not complete between Oct. 14 and 19th; and none were available after Oct. 19th, pending repairs to the clock.

N E W P L Y M O U T H
H A S T I N G S

Wood-Anderson Short-period Seismograph; E-W compt.
Milne-Jaggard Seismograph; NE-SW compt.

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (degrees)	Remarks
Oct. 1	S	20 01 12			
Oct. 4	i	23 56 (00)			
2	iS i	57 10 21			
18		7 57			Small local tremor.
4	P?	23 56 55		6.4?	
27	i iM i	16 14 (00) 58 04? 07			
5	iP iS i	16 41 09 10 5 12		1.4	
6	P	20 41 07		0.7	
28	S? i	12 51 (00) 05			
18	iP? S	9 42 06 32		2.3?	
31		17 44			Local tremor.

Note: Owing to clock trouble, records were not complete between Oct. 18 and 31st; and none were available after Oct. 19th, pending repairs to the clock.

B U N N Y T H O R P E

Milne-Jaggard Seismograph; E-W compt. NW-SE Compt.

(6)

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (degrees)	Remarks
Oct. 27	P i S i i	16 14(00) 02 05 19 24 29		0.45	



T A K A K A

Milne-Jaggard Seismograph; E-W compt.

Small tremors were recorded as follows :- Oct. 17d 4h; 17d 6h 30m;
19d 11h 30m

CHRISTCHURCH (MAGNETIC OBSERVATORY)

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

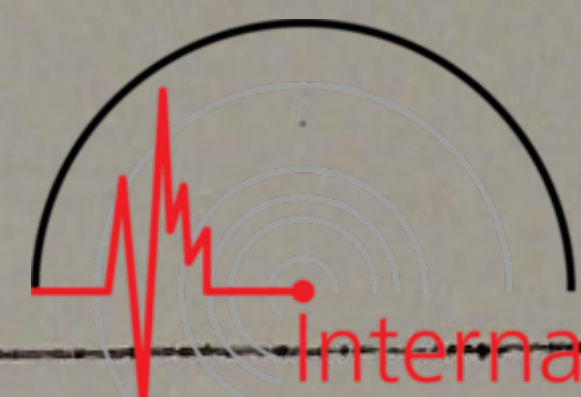
Wood-Anderson Short-period Seismograph; E-W compt., magnetic damping; Pend. period=0.8 sec., damping= 0.85.

Date 1936	Phase	G.M.T. h m s	Period (sec)	Distance (degrees)	Remarks
Oct. 10	P i S?	17 40 25 35 51		2.3?	
11	P S	1 01 34 02 17		3.7	
18	P S	9 41 56 42 27		2.7	
22	S	16 14 55			
31	S iM iM i	2 53 06 09 12 15			
31	S i i iM	15 06 40 50 55 58			

N O T E S

No earthquakes were recorded during the month at STRATFORD, GREYNOUTH, and MONOWAI. The stations at EAST CAPE and GLENWHICK were not operating during the month.

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



International
Seismological
Centre

Origin Time (G.M.T.) 1936 d h m	Provisional Epicentre		Focal Depth	Remarks
	Lat. (deg)	Long. (deg)		
Sept. 4 22 22 10 50	40.3S	173.5E	Normal	Felt in north-western part of South Island, max R-F 6.
14 3 42	38.3S	177.2E	Deep	
29 16 35	21 S	171 E	Normal	Epicentre from Wellington, Christchurch, Riverview.

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological reports, received during the month of September 1936 :-

Little Rock, 1935 Oct.-Dec., 1936 Jan.-May
 Central Station of the Jesuit Seismological Association, 1936 June
 3, 7, 9, 10, 12, 14, 16, 20, 22, 28, 29, 30; July 31; Aug. 18, 22.
 Florissant, 1936 June.
 Hong Kong, 1936 August.
 Taihoku, 1936 August (preliminary), quarterly reports for 1935 Apr-Sept.
 Chiufeng, 1936 August.
 Kew, 1936 August.
 Stuttgart, 1934, 1935.
 Schweizerisches Erdbebenbulletin, number 75.
 Ksara, 1936 August (preliminary)
 San Fernando, 1936 September (preliminary)
 Perth, 1936 number 12.
 Adelaide, 1936 September (preliminary)
 Riverview, 1936 September.
 Sydney, 1936 Aug-Sept.
 Apia, 1936 July-Aug-Sept.
 Pasadena, 1936 June-July-Aug.
 Madagascar, 1936 Jan-Feb.
 Ottawa, 1936 August.

MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN - ~~SEPTEMBER~~^{XX} 1936
OCTOBER

(Prepared by the Director of the Magnetic Observatory)

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES - REMARKS.
OCT. 2d	KK	13.10ca	slight seismic activity commenced.
" 3d	eP?	19.46.21	
	eS?	49.31	
	L	51.42	
	M	53.13	
"			
" 3d	iPNEZ	22.00.39	compression, probably from W.N.W., papers changed 22.06.46.
" 4d	ePNEZ	23.57.09	small dilatation, NNE?, 10.7
	iNEZ	57.17	compression N.N.E., 18 second period.
	eS	59.20	pulsatory.
	LE	60.10	
	M	61.17	largest on E, despite probable azimuth.
	iEZ	67.42	the largest movement on Z.
" 5d		6.45ca.	followed by surface waves for about 10 mins.
" 5d	iP	9.54.34	compression, W.N.W., 59.6
	iNEZ	58.50	PcS?
	iS	10.02.50	
	iScSNE	04.24	large on E.
	PcSScP	10.09	
	G	11.45	
	L	13.19	
	eNEZ	14.50	36 second period.
	MEZ	17.45	
	eNE	12.14ca.	
	ENE	12.19ca.	
	eNEZ	12.27ca.	
" 11d.		12.45ca.	surface waves in strong microseisms.
" 12d.	SP?	6.58.02	22.8?
	S	7.02.10	
	L	4.34	
	M	6.36	
" 12d		9.39ca	a few surface waves.
" 13d		7.05ca.	some small surface waves.
" 14d	LN	22.24.52	
	iZ	25.12	
	M	27.40	
" 15d	iP	20.57.00	24.1
	iS	21.01.20	
	L	03.37	
	MNZ	05.40	
" 16d	eP	12.04.16	dilatation ? 39.1
	S	10.25	
	ScS	13.43	
	LN	15.12	E component not recording.
	M	18.15	
" 19d	ePZ	12.14.15	59.2, compression, then large dilatation.
	iS	22.28	
	LN	32.40	surface waves not large.
	MEZ	37.38	
21d.		13.15ca.	slight seismic activity began.

(9)



DATE	PHASE	G.M.T.	DISTANCE IN DEGREES - REMARKS.
OCT. 22d	ePZ?	9.58.24	47.7?
	eS?	10.05.25	
	eLE	13.04	
	M	17.02	
" 22d		16.16ca.	Slight seismic activity began.
" 23d	ePNZ	6.41.58	compression, 85.4
	eN	49.00	
	eE	51.00	
	SNZ	52.31	
	eLE	7.09.07	
	MNZ	15.23	
" 23d	ePE?	19.38.56	17.0
	iS	42.12	
	L	43.42	
	MEZ	45.32	
" 24d.	P	18.06.07	16.1?, in microseisms, interpretation doubtful.
	SN	09.14	
	LE	10.24	
	M	12.30	
" 26d.	ePNZ	19.43.29	83.6, very small compression.
	S	53.53	largest on N.
	eGN	20.06.45	40 sec. period, indefinite on E.
	LEZ	12.07	25 do. do. do. " N, small.
			but definite on Z.
	MNZ	18.10	18 second period.
" 29d.	eE	6.20.56	
	eNEZ	25.20	
	eNEZ	42.16	30 second period.
" 29d.	iPZ	18.49.15	66±, small sharp dilatation.
	iPNEZ	49.17	compression, NNW.
	ipPNZ	50.25	
	iNEZ	52.32	
	eS	57.37	P? through surface layers.
	iSNE	57.46	
	isSN?	59.57	Probably over 300km. deep, surface waves same order of size as earlier ones.
" 30d	eP	15.06.40	
	eS	7.32	

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.H. Jones.

Acting-Director, R.C. Hayes.

Instruments and Constants:-

Milne-Shaw (N-3)	Pend. period = 9.8 sec.	Damping 25:1 (1936 Oct.)
Milne-Shaw (E-1)	" " = 9.1 "	" 20:1 " "
Wood-Anderson (N-3)	" " = 0.55 "	" 9:1 " Aug.
Galitzin-Wilip (Z)	" " = 7.0 "	$\mu = +0.43$
Galv. "	= 10.6 "	$\frac{AK}{\pi l} = 160$

All seismographs have magnetic damping.

The constants of the Galitzin-Wilip are unreliable

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD (sec)	DISTANCE (deg)	REMARKS.
Nov. 1	P S	12 55 32 46		1.2	Felt at Palmerston North and Masterton.
2	P pP? PP S ScS? PPS SS i SSS i Lr L? M	20 58 41 54 21 01 47 08 47 09 09 55 14 25 50 17 20 58 26 00 29 31		80.5	May be SSSS or Lq.
5	P S	19 16 05 23		1.6	
8	P S	14 09 59 10 25		2.3	
9	P i i i S i i i	12 29 58 30 03 08 15 49 50 53 55		4.5	Felt in eastern parts of North Island, max. R-F 4. Epicentre near 39°.5 S, 180°
9	P iS? i i M	22 22 51 23 03 04 06 09		1.1?	
10	P S	13 38 38 51		1.2	
11	P i A S	8 07 34 38 43 48		1.2	Felt at Wanganui, R-F 3.



DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD (sec)	DISTANCE (deg)	REMARKS.
Nov. 11	P i S i	8 13 14 21 28 31		1.2	Felt at Wanganui, R-F 5.
11		10 23			Tremors.
12		2 52			Traces.
12		5 10			Distant tremors.
12		9 04			" "
13	i? e e e eL e	12 52 52 55 48 56 35 57 29 13 13 31	36		
14		3 59			Traces.
15	P i i i	21 57 56 58 02 09 13			
19	e i eL M	21 23 35 00 53 22 01	20		
21	i i	4 09 05 10 31			Small tremors.
22	P? S L	14 46 55 48 35 50		8.9	Deep focus Epicentre near 36°S, 176° W.
22	P i i S i i	17 39 53 59 40 02 15 19 22		1.9	Felt in northern part of South Island, max. R-F 5. Epicentre 41°43', 172° .8E.
22	eL M	19 07 10	20		Prolonged.
23	P S i	0 58 10 20 23		0.9	
24	P i S	6 38 33 49 50		1.5	Felt in western and southern parts of North Island, and also at Collingwood; max. R-F 5.
24	P S	12 26 51 27 05		1.2	
25	P S	10 52 51 53 11		1.8	



DATE 1936	PHASE	G.M.T.			PERIOD sec	DISTANCE deg.	REMARKS.
		h.	m.	s.			
Nov. 29	P	8	30	27		20.6	
	PP			47			
	S	34	10				
	SS			55			
	L	35	29				
	M1	36		17			
	M2	39		18			
30	P?	17	16	02		5.0?	P very feeble, interpretation doubtful.
	S?			59			
	L?	17	42				

In addition, small local tremors were recorded as follows. -

Nov. 8d 11h 41m; 9d 11h 41m; 9d 21h 51m; 11d 03h 06m; 13d 05h 06m;
26d 05h 06m; 26d 07h 05m; 26d 08h 38m; 26d 16h 16m, 30d 17h 54m.

A R A P U N I.

Milne Seismograph; E-W component, undamped, Pend. Period=22 sec.
(1936 Nov.); Magnification = 5.6

DATE 1936	PHASE	G.M.T.			PERIOD sec.	DISTANCE deg.	REMARKS.
		h.	m.	s.			
Nov. 9	i	3	59.1			Doubtful if seismic.	
	i	4	38.9				
	i		43.1				
11		8	07			Disturbed record, phases not clear.	
13	i	12	56.1				
	l	13	11.0				
	eL?		16.7				
	M		21				
15		13+				Irregular movements.	
19	eL	21	57			Tremors.	
22	e	14	46				
	L		48				
29	eP?	8	30+			In time gap.	
	S		32.8				
	L?		34				

T U A I.

Milne-Jaggur Seismograph; E-W compt.



DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Nov. 9	P i S iM	12 30(00) 06 27 31	.	2.4	
26	P S	16 16(00) 05		0.45	

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

Wood-Anderson Short-period Seismograph; E-W compt.

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Nov. 21		2 25			Tremors.
21	P	4 08 38			Irregular tremors.
22	P? S? iL?	14 46 53 48 11 53		6.9?	
22	P i S	17 40 09 24 43		3.0	
23		0 57			Tremors.
24	P S	6 38 35 52		1.5	
26	P i i i	16 16 28 36 43 55			
29	e L	8 32 33			Distant shock.

H A S T I N G S.

Milne-Jaggur Seimograph; Ne-SW compt.

DATE 1936	PHASE	G.M.T. h.m.s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Nov. 9	eP? i S iM i i	12 30(00) 07 18 23 33 41		1.8?	Time of P doubtful.
13	P i iM1 iM2 l	15 01(00) 06 07 12 20			



DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Nov. 15	i i	19 38(00) 02			
16	P iM i i	18 48(00) 05 19 32			Felt at Waipawa, R-F 3.
25		21 18			Tremors, doubtful if seismic
26		16 16			"

BUNNYTHORPE.

Milne-Jaggard Seismograph; NW-SE compt.

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Nov. 1	P i S i i	12 50(00) 04 09 14 18		0.8	

TAKAKA.

Milne-Jaggard Seismograph; E-W compt.

Small local shocks were recorded as follows:-

Nov. 8d 14h 10m; 22d 17h 39m; 24d 06h 38m.

CHRISTCHURCH (MAGNETIC OBSERVATORY)

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

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

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Nov. 11	P S	12 30 32 31 49		6.8	
22	P? S	14 47(18) 49 37		12.5?	P very small & indefinite.
22	P i iS? i	17 40 03 11 20 30			
24	P? i S	6 38 42 39 16 37		4.8?	P very uncertain.
25	P S	10 53 10 41		2.7	

M O N O W A I.

Milne-Jaggard Seismograph; E-W compt.

International
Seismological
Centre

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Nov. 25	P is?	6 19(00) 03		0.3?	

NOTES.

No earthquakes were recorded at STRATFORD and GREYMOUTH during the month. The seismographs at EAST CAPE and GLENNICK were not operating during the month; and the seismograph at NEW PLYMOUTH was out of action during the first half of the month for repairs to the clock.

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

Origin Time (G.M.T.) 1936 d h m	Provisional Epicentre		Focal depth	Remarks.
	Lat. (deg)	Long. (deg)		
Oct. 4 23 54	33 S	175 W	Deep	
10 17 40	42.5S	175.5E	Normal	
11 01 00	42.5S	177.5E	Normal	
18 09 41	40.7S	172.0E	Normal	Felt in northern part of South Island, New Zealand.
27 16 13	39.8S	175.1E	Normal	Felt in Hawkes Bay district and southern part of North Island New Zealand.

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological reports, received during the month of November, 1936.

Mizusawa, 1935 January - December.
 Pennsylvania, 1936 Report **II**
 Uccle, 1936 No.3
 Melbourne, 1936 July, August, September.
 Manila, 1936 August, September (Preliminary)
 Chinpeng, 1936 September.
 Taihoku, 1935 October, November, December; 1936 September (Preliminary)
 Hong Kong, 1936 September.
 Bureau Central Seismologique Francais, 1936 August.
 Universite de Strasbourg, 1936 August.
 Union Geodesique et Geophysique Internationale, 1936 August.
 Parc Saint-Maur, 1936 August,
 Toronto, 1936 June, -July, -August.
 Nanking, Vol. 4 No 4, April-June 1936.
 Madison, 1935 October - 1936 May.
 Perth, 1936 No 13.
 Adelaide, 1936 October, (Preliminary)
 Riverview, 1936, October.
 Kew, 1936 September.
 Vladivostok, 1936 July -August.
 Hamburg, 1936 Nos. 10 - 19.
 Ottawa, 1936 September.

Rathfarnham, 1936 July-August-September.
 Schweizerches, Erdbebenbulletin No.76.
 Batavia, 1936 April-June.
 Bucarest, 1936 July - August - September.
 Pasadena, 1936 September
 Jesuit Seismological Association, 1936 August 23rd, Sept. 10, 25,
 Oct. 5.
 Manila, 1936 October, (Preliminary)

MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN - NOVEMBER, 1936.

(Prepared by the Director of the Magnetic Observatory)

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES - REMARKS.
Nov. 1d.	eS	16.32.45	small amplitudes.
	L	47.47	
	M	53.47	
2d.	iPNZ	15.10.58	91.0, compression.
	SKS	21.21	
	S	21.57	
	GE	35.55	
	L	41.17	
	MNZ	45.53	
	ME	48.30	
2d.	ePNZ	20.58.39	82.2, dilatation, compression
	iPNEZ	58.49	
	iS	21.08.56	
	iPS	10.06	
	L	21.26.16	
8d.		12.38ca.	slight seismic activity.
11d.	PEZ	10.22.28	28.8 38 second period.
	S	27.22	
	GN	28.28	
	L	30.28	
12d.	PN?	2.42.27	27.0?, in microseisms.
	S	47.10	
	L	50.19	
12d.	GN	5.09.15	
	L	11.07	
12d.	eNE	8.56.26	surface waves. " "
	eZ	9.03ca.	
13d.	iPNZ	12.45.20	98 ⁺ , compression Large, 48 second period.
	PR1NZ	49.22	
	iNZ	55.26	
	SKS	55.52	
	iS	56.51	
	PS	58.08	
	SR1NE	13.03.46	
	SR2N	7.34	
	GE	12.48	
	LNZ	18.00	
	LE	19.02	

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES	REMARKS.
Nov. 19d.		0.25ca.		slight seismic activity.
19d.	PZ	21.24.34	102±	compression.
	PRIZ	28.39		
	SKSE	35.04		
	PS	37.49		
	PPS	38.34		
	eNE	39.49		large on T, 30 second period.
	SR1	43.56		" " "
	SR2E	47.59		
	GNE	52.51		large on N, 48 second period.
	L	58.43		largest on E.
	record off 22.01.19.			
22d.	eS?	14.49.39		small pulsations.
	eNE	40.40		30 second period, G?
	eZ	51.40		followed by surface waves on all components for about 30 minutes.
22d.	eP	17.40.03		pulsatory, a near shock.
	iZ	40.22		
	iNEZ	40.34		
	iNZ	40.41		no surface waves.
22d.	PEZ	18.43.54	67.7	small on Z.
	iSE	52.56		
	eSNZ	52.56		
	GN	02.40		40 sec. period, 4.23 km./sec.
	L	07.16		
29d.	P	8.30.42	22.8	in strong microseisms.
	iS	34.50		
	L	36.58		
30d.	eL	17.20.54		earlier movement masked by microseisms.
30d.	iPZ	23.55.43	63.0	compression.
	S	24.04.20		in strong microseisms.
	GN.	11.53		
	L	15.53		

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

- Sydney, July-Sept. 1936.
 J.S.A., Central Station, 1936 pp.11-23
 Little Rock, 8-15, 1936 1-10
 Denver, 1935, pp.1-4
 St. Louis, 1935, pp.23-28, 1936 pp.1-11
 Florissant, pp.8-26.
 Manila, Jan.-June, 1935.
 Northern California, Vol.4, Nos.3-4, Vol.5, Nos. 1-2.
 Riverview, Aug-Oct. 1936.
 Pasadena, May-Sept. 1936.
 Apia, July- Sept., 1936.
 Tokyo, E.R.I., Vol.XIV, Part 3.
 Pennsylvania State College, Report ii, 1936.
 Melbourne, July-Sept., 1936.
 Academia Sinica, Vol.4, No.4, Apr.-June, 1936.
 Hamburg, No. 19.
 Batavia, Apr.-June, 1936.

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.-

Milne-Shaw (N-S)	Pend.period=	10.2 sec.	Damping	25:1 (1936 Dec.)
Milne-Shaw (E-W)	" "	= 10.0 "	"	20:1 (" Dec.)
Wood-Anderson (N-S)	" "	= 0.55 "	"	8:1 (" Dec.)
Galitzin-Wilip (Z)	" "	= 7.0 "	$\mu = +0.43$	$\frac{AK}{I} = 160$
	Galv. "	10.6		

All seismographs have magnetic damping.

The Constants of the Galitzin Wilip are unreliable.

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Dec. 1	eL	0 22			Irregular movements disturbed by heavy microseisms
1	P? S? L?	00 37 42 38 44 39 27		5.5?	P small.
1	S? L?	3 11 18 12 01			
2		18 30			Tremors.
3	i e L M	3 14 55 18+ 20 23	14		
3	P S? iM	6 36 55 37 04 07		0.8?	
3	P S iM	15 51 54 52 07 09		1.2	Felt at Wanganui, R-F 4
4	P PP i S SS L M	22 30 50 31 20 32 18 34 40 36 21 37 39	5 15	21.3	
4	iS? L M	23 7 07 9+ 11	15		Renewed movements, confused with tail of previous shock.
5	e eL	5 20 26	15±		
5	eL M	14 45 46	15		
5	P S i i	19 00 02 02 50 03 02 44		15.2	

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Dec. 5	P S L	22 31 38 34 00 35 10	10	12.8	
5	e L M	23 24 26 28	14		
6	eP? S L	2 30 20 33 00 34		14.5?	P small.
6	P? L	2 51 57 55 11			P small
6	P? S?	14 15 02 42		3.5?	
8		19 43			Local tremor, felt at Wanganui, R-F 2
10	P? S	0 49 44 51		0.6?	P very doubtful. Felt at Wairoa. R-F 4-5
11	P S i M e	20 08 06 28 31 32		1.9	Felt at Kahurangi Bt. R-F 6 also at Westport. Epicentre 40.7° S, 172.4° E.
12	e	3 11			Traces.
13	eL	21 57			Small & prolonged movements.
13	P S L M	21 41 08 49 20 59 22 07	18	60.0	Very small, but prolonged movements.
16	i i	19 28 27 36 35			Irregular tremors.
17	e	3 52			Tremors. strong microseisms.
17	P? S	8 44 23 45		1.9?	
20	e	3 32			Traces
21	e	19 52			Traces
21	e	20 18			Tremors.
22	eL	9 56			Traces
23	i eL M	6 44 28 46+ 49	11		
25	eL	20 47	15-20		Long series of regular waves till about 21h.08m.
26	P i S	17 42 15 17 27		1.1	

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Dec. 26	P i S iL? i	22 55 31 56 35 57 25 58 25 59 13		10.2	
29	P i ipP? PcP PP PcS S SS ScS Lq Lr Ml	14 55 30 50 56 2 57 44 55 15 01 32 02 15 04 56 05 18 06 15 07+ 09	6 30 20	46.3	
31	eP i i S i	16 29 28 37 50 30 19 23		4.5	Felt at Hamner Springs, R-F 5
31	e	22 40			Traces

In addition small local tremors were recorded as follows:-

Dec. 3d 15h 26m; 4d 19h 55m; 6d 17h 18m; 13d 08h 28m; 16d 22h 56m;
18d 10h 27m; 22d 02h 19m; 22d 09h 02m; 26d 18h 14m.

A R A P U N I.

Milne Seismograph; E-W component, undamped, Pend. Period=24 sec.
(1936 Dec.); Magnification = 5.6

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS+
Dec. 1	e? M	0 12 20			
3	eL	3 20			Tremors.
4	eS? i	22 33.4 36.0			
4	e	23 06			Tremors
5	P S?	18 19+ 19 00+			Record interrupted by hour gap.
17	e	3 48			Tremors.



ROTORUAInternational
Seismological
Centre

Milne-Jaggard Seismograph.

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Dec. 2		17 0			Shock.
2		17 29			"
2		18 5			" , also other minor tremors.
4		1 40			Irregular disturbances for 2 min.
4	i iM	16 45 (0) 3			
8	i i i iM	2 35 (0) 11 18 27			Possibly succession of separate tremors.
11	i i i iM i i	0 37 (0) 8 10 14 20 34			Also minor tremors.
23		21 0			
24	i	3 47 (0) 7 17			Also other minor tremors.

TUAI.

Milne-Jaggard Seismograph; E-W component.

Dec. 31	P S i i	16 23 (0) 6 10 17		0.3	
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NEW PLYMOUTH.

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

DATE 1936	PHASE	G M T h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Dec. 2	P? i iS i i	6 15 11 44 49 16 01 05		3.3?	
3	P? S	15 51 58 52 12		2.1	
4	e L	22 30 36			Prolonged tremors from distant shock.

DATE 1936	PHASE	G.M.T. h. m. s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Dec. 4	eL	23 08			Tremors from distant shock
5	e	19 00			Prolonged tremors from distant shock.
8		19 43			Local tremor.
10	P? S?	0 49 28 47		1.7?	
11	P S	20 08 11 41		2.6	
12		1 17			Tremors, faint record.
12		2 57			Local shock, phases not clear owing to faint record.
19	P S	0 39 38 40		0.2	
26		22 55			Tremors from distant shock.

CHRISTCHURCH (MAGNETIC OBSERVATORY)

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

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

DATE 1936	PHASE	G.M.T. h. m.s.	PERIOD sec.	DISTANCE deg.	REMARKS.
Dec. 2	P? S	6 14 00 20		1.75?	P very small & indefinite.
9	P? S	1 07 47 08 08		1.8?	P on edge of record.
11	P i i iS?	20 08 22 27 41 55		2.9?	
31	P? i i	16 29 13 18 30			Maximum on first impulse.

NOTES.

No earthquakes were recorded during the month at STRATFORD, HASTINGS, TAKAKA, and GREYMOUTH.

The seismograph at EAST CAPE and GELNMWICK were temporarily out of action.

The records from NEW PLYMOUTH have been somewhat interrupted by clock trouble.

Provisional Epicentres in New Zealand and South-west
Pacific, 1936 November.

Origin Time (G.M.T.) 1936 d h m	Provisional Epicentre		Focal Depth	Remarks.
	Lat. (deg)	Long. (deg)		
Nov. 9 12 29	39.5 S	180	Normal?	Felt in eastern parts of North Island, N.Z. max. R-F 4
22 14 46	36 S	176 W	Deep	
22 17 39	41.4 S	172.8 E	Normal	Felt in northern part of South Island, N.Z. max. R-F 5
29 08 25	26 S	167 E	Normal	

The Acting-Director of the Dominion Observatory gratefully acknowledges the following seismological reports, received during the month of December, 1936.

Manila	1936 Sept., No 31.
Bureau Central Seismologique Francais	1936 Sept.
Union Geodesique et Geophysique Internationale	1936 Sept.
Parc Saint-Maur Strasbourg	1936 Sept.
Phu-Lien	1936 May - April
Hong Kong	1936 Oct.
La Paz	1935 Nov. - Dec. Jan. 1936
Riverview	1936 Nov.
Ksara	1936 Sept. (Provisional)
Adelaide	1936 Nov. (Preliminary)
Kew	1936 Oct.
Gottingen	1935 Oct. - Dec, 1936 Jan - March.
Schwiezerisches Erdbebenbulletin No 77	
Manila	1936 Nov. (Preliminary)
Sydney	1936 Oct.

Chiufeng	1936 Oct.
Tyosen	1936 April - August.
Manila	1936 Nov. (Preliminary)
La Plata	1936 Oct.
Taihoku H.O.	1936 Oct.
Toronto	1936 Sept.
Hong-Kong	1936 Oct.
Zi-Ka-Wei	1936 April - Sept.
Ottawa	1936 Oct.
Manila	1936 Nov. (Special Bulletin)
Pasadena	1936 Sept. (Local shocks)
Phu-Lien	1936 Juin and July.
Manila	1936 Oct.
Zi-Ka-Wei	1936 July - Oct. (Preliminary)
U.S. Coast and Geodetic Survey	1936 Nov. (Preliminary)
Georgetown Despatches August through October, 1936.	
Ksara	1936 Oct. (Preliminary)
Hong Kong	1936 Nov. (Preliminary)
La Plata	1936 July - Sept.
Sydney	1936 Nov.
Observatoire de Tananarive	1936 March, April.
U.S. Coast & Geodetic Survey	1936 Nov. (Preliminary)
Strasbourg	1936 Oct.
Bureau Central Seismologique Francais	1936 Oct.
Union Geodesique et Geophysique Internationale	1936 Oct.
Parc Saint-Maur	1936 Oct.

MAGNETIC OBSERVATORY, CHRISTCHURCH.

PROVISIONAL EARTHQUAKE BULLETIN, DECEMBER, 1936.
(Prepared by the Director of the Observatory)

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES - REMARKS.
Dec. 1d		17.33.aa	Slight seismic activity.
2d	P in or near hour gap?		
	SNE	18 27 15	
	Lq	28 09	Largest on N
	Lr	28 53	
4d	iPNZ	22 31 08	Compression from N 22.1
	S?	35 10	Largest on E
	Lq	35 40	Largest on E
	Lr	37 10	Fits 22°1 by Macelwanes Tables
	M	39 04	Small on E
5d	eP?	5 20 16	Compression 22.5
	S	24 22	
	Lr	26 24	
5d	P?	14 37 07	Compression 22.6 Small in microseisms
	S?	14 41 14	
	LqE	42 02	
	Lr?	43 30	not on Z
	MNZ	45 50	



DATE	PHASE	G.M.T.	DISTANCE IN DEGREES - REMARKS
Dec. 5d	P?	19 01 11	Small compression.
	iSN	03 11	
	LqE	03 40	
	LrN	03 45	
	MNZ	04 30	
5d	SNZ?	22 34 26	
	LqE	35 20	
	LrN	35 40	
	MNZ	36 36	
5d	SN?	23 25 12	Small on N. 30 seconds. 24 seconds. 20 seconds.
	LqE	25 46	
	LrNZ	26 40	
	MNEZ	27 56	
6d	An irregular train of waves commenced at 2.32 ca with larger waves 2.56 ca and 2.58 ca.		
13d	iPNEZ	21 41 15	Compression, 61.0 Largest on N 32 second period.
	iSE	49 40	
	SR1	53 46	
	Lq	57 10	
	LrZ	22 01 25	
14d	LrEZ	4 44 05	
	LrN	44 36	
	MEZ	49 00	
14d	LqE	20 38 55	26 seconds, very small.
	LrN?	41 29	
16d	Slight seismic activity in strong microseisms at 19 40 ca		
17d	"	"	" " " at 3 52 ca no
17d	"	"	time eclipses.
17d	"	"	" strong microseisms at 13 56 ca
17d	"	"	no time eclipses.
17d	"	"	" strong microseisms at 21 12 ca
17d	"	"	no time eclipses.
20d	LqN?	3 32 18	Largest on E
	LrEZ	3 34 24	
20d	iPNE	18 49 47	57.3 large on N
	eSNE	57 48	
	LqE	19 04 44	
	LrNEZ	08 10	
21d	ePN?	19 50 09	22.3 in strong microseisms.
	SN	54 13	
	LqE	54 32	
	LrNZ	56 35	
21d	PN	20 13 40	22.1 apparently a separate shock on coda of previous one.
	SN	17 42	
	LqE	18 02	
	LrNZ	20 02	
22d.	PNE	8 38 40	48.0
	SNEZ	45 42	
	LqE	49 41	
	LrNZ	53 20	

DATE	PHASE	G.M.T.	DISTANCE IN DEGREES -	REMARKS.
Dec. 23d	PNZ	6 39 24	22:9	
	iSNE	6 43 33		
	LqE	43 52		
	Lr	45 36		
25d	LqN	20 48 15		
	LEZ	52 29		
26d	PNEZ	22 56 02	12:1 compression az. SSW.	
	SNEZ	58 27		
	LqE	58 37		
	LrNZ	59 29		
27d	P	8 56 33	22:4	
	S?	9 00 36		
	LqE	9 01 00		
	LrNE	02 47		
	MNZ	04 37		
27d	Surface waves on E & Z from 18 42 ca Larger on E.			
29d	iP	14 55 37	Large compression az NNW, 100 Km deep Br. Ch.	
	pP	56 01		
	iPcPNE	57 59		
	iS	01 49		
	iS SNE	02 33		
	iScS	05 16		
	LqE	05 45		
	LrZ	07 50		
29d	22 17 ca	a few small surface waves.		
31d	ePZ	16 29 13	A small near shock.	
	ePNE	29 16		