FIFTH

ANNUAL REPORT OF THE SEISMOGRAPH STATION AT HILL VIEW, WOODBRIDGE HILL, GUILDFORD, ENGLAND

YEAR 1914

PRINTED AT THE OBSERVATORY.

THE SEISMOGRAPH STATION AT HILL VIEW, WOODBRIDGE HILL, GUILDFORD, ENGLAND.

YEAR 1914, ANNUAL REPORT.

POSITION, $\lambda = 0° 35' 47''$ W. of Greenwich: $\Phi = 51° 15' 2''$ N. Booms 187 feet (57 metres) above mean sea level. Base. London Clay (Eocene).
GREENWICH MEAN TIME (0 = midnight) is kept.
INSTRUMENTS (a) Modified Milne type, 2 Booms facing North (N) and west (W) each 3ft (91·4 cm.) long; Mast 4'2" (1·27 metres) from Booms to summit. Weight = 100 lbs (45·36 k.) at outer end of each Boom. Period 11 secs., magnifying levers x 45 times. Crossed slit photographic recording.
(b) Modified Milne type, 1 Boom facing West, 3ft. long: top of Mast 2'8" above Boom: weight at outer end of Boom = about 5 lbs: Galvanometer record with magnification x 300 (varying).

ABBREVIATIONS USED.

h = hour, m = minute, sec = second, of Mean Time.
i = impetus, a sudden, marked, wave-front: e = gradual emergence of waves.
N, S, (small) = movement of West Boom towards the North or South respectively.
Amplitude, in millimetres (mm), denotes range of movement of Boom.
micro = microscopic, (when such movement is less than 0·02 mm. in range).
With the above exceptions, the International Abbreviations have been employed.

PREFACE.

THE aim, as it appears to me, of true scientists is cooperation throughout the world to dis-cover, and to organise this knowledge for the elevating and preservation of the mind and body, the energy and property, of man.
Therefore I do what I can to aid my Motherland to overthrow that school of thought which distorts and exploits the organisation of science in order to be able to destroy. Being unable to serve "with the Colours", I have found time to duplicate this Report
As an interesting example of propogation of seismic waves, of instrumental organisation, and of the behaviour of individual instruments, I append, from the Osaka monthly report, a list of instrumental commencements for the Akita earthquake of March 14th.

F. E. Norris. January, 1915.

1914 March 14, compared commencements.

Place	N. lat.	E. long	Instrument	Commencement (P).
Akita	39° 41′	140° 6′	Omori,	19h 58m 42 sec.
Kinkasan	38 17	141 35	(or Gray Milne)	59 46
Aomori	40 51	140 45		20 0 0?
Tappisaki				" " "
Yamagata	38 15	140 21		" "
Miyako	39 38	141 59		0 25
Ishinomaki	38 26	141 19		37
Hakodate	41 46	140 44		48
Nagoya	35 10	136 55		5 8
Mito	36 23	140 28		1 0
Yokohama	35 27	139 39		16
Kanayama	37 53	140 46		20
Tokyo	35 40	139 48		20
Kofu	35 40	138 34		29
Numadzu	35 6	138 51		37
Mayebashi	36 24	139 4		45
Miyatsu ?	35 32	135 12		45
Kumagaya	36 9	139 23		50
Osaka	34 42	135 31		2 3
Nagano	36 40	138 10		18
Niigata	37 55	139 3		20
Fukuoka	33 35	130 25		27
Utsunomiya	36 34	139 53		34
Takayama	36 9	137 16		42
Nagasaki	32 44	129 52		51
Zi ka wei	31 12	121 26	Wiechert	4 1 2
" " "			Omori.	1 5
Changchun	43 48	125 29	"	23
Taihoku	25 2	121 31	"	52
Irkutsk	52 16	104 19	Galitzin	5 8
Manila	14 34	120 58		6 22

Date 1914	Phase	GREENWICH MEAN TIME h	m	sec	Period T sec	Amplitude of N mm	of W mm	Distance Δ Km.	Notes.
2/I	e1	15	41	18				1800?	
	e2		44	23					
	e3		45	21					
	M		47	42	8		0·8		
	F	16	0	45					
3/I	e L	19	15	45					Irkutsk, L 19 33
	M		20	36	19·5		0·15		
			26	42	18		0·1		
	F		42	24					
12/I	P1	9	40	0				10155	Off Sakurashima, Kyushye,
	P2		43	40				10155	Japan. Relief of neighbouring
	S1		51	5					strain, during volcanic activity.
	S2		54	45					Fukuoka, P 9 28 58
	L1	10	13	20					Chemulpo, 29 13
	M1		14	15	28		0·2		Nagasaki, 27
			17	12	28		0·3?		Osaka, 28
	L2		18	24	18		0·8		Zi ka wei, 30 4
	M2		19	18	19		0·8		Dairen. 30 11
			21	0	20		0·7		Tokyo. 13
			22	0	16		0·9		Taihoku. 32·5, Δ1695 k.
			22	25	19		0·8		Mizusawa. 55
			24	40	17		1·0		Changchun, 57
			25	37	17		0·7		Manila, 32 33
			26	33	18		0·9		Irkutsk, 33 54
			28	0	17		0·9		
			29	41	17	x	1·0		x distorted.
			31	22	17·9		0·5		
	C		40	0	18		0·05		
			57	5	18·5				
	F	11	12	0					Osaka, F 10 51 18.
15/I	L	20	24	24					
	M		34	21					
	M	21	41	0					
20/I	P	12	10					9645	Irkutsk, P 12 6 52, Δ 3400k.
	S		20	42					Taihoku, e 7 23·9
	L		42	0					
	M		52	0	20		0·7		
30/I	P	3	50	24				9775	Ottawa, P 3 48 14, Δ9750k.
	S	4	1	12					S. Fernando, 49 0 9400
	L		20						Irkutsk, 56 13
	M		35	18	25	4·0			Taihoku, L 4 28 10·4
				36	18		8·0		
			37	42	18		8·8		
	F	6	20?						
30/I	e	8	2	30					Irkutsk, eP 7 55 56
	L		30						
	M		36		23	0·3			
			38		19		0·8		
7/II	N S? N	7	9	25			0·7		Osaka, P 6 52 28
	N		12	0			0·75		Taihoku, 54 54·1, Δ4042k.
	M N		38	0			1·0		
14/II	e P	17	41	53				4350	
	S		48	0					
	L		53	20			2·8		
	M		58	59			3·0		
			58	43	7·5				
	F	18	12	36					
24/II	e L	22	51	58					Irkutsk, eP 21 52 44.
	M		57	45	23		0·7		
26/II	e P	5	11	9				9515	Irkutsk, P 5 17 39, Δ 8940
	S N		21	45					
			38	55					
	M		39	35	15		1·5		
			52	19	15		1·2		
	F	7	1	0					

Date 1914	Phase	GREENWICH MEAN TIME h	m	sec	Period T sec.	Amplitude of N mm	Amplitude of W mm	Distance △ km.	Notes.
27/II	i	3	38	15					
	S		46	24					
	e		57	0					
	M	4	5	20	17		0·9		
			12	25	18		1·2		
28/II	e P	5	12	45				7665	Ottawa. P 5 8 22.
	S		21	48					
	L		37	18					
	M		45	42	20				
6/III	P	19	17	24				8915	Osaka, " 19 10 4
	S		27	30					Irkutsk. P 12 9 Δ 3515.
	L		47	36					Otomari 8 43
	M		51	36	23		0·4		Hakodate 9 34
	C		57	30	20		0·8		Mizusawa 10 5
	P	20	25	0	18		0·3		Manila, 14 37
7/III	P	8	14	48				6865?	
	S?		23	10					
	M		41	18	16		0·15		
7/III	P	17	9	9				7545	
	S		10	6					
	i		18	6					
	e		19	15					
	L		30	30					
	M		34	24	21		0·4		
			45	8	20		0·5		
10/III	e	16	13	30					
	S		21	5					
	L		35	0					
	M		39	36	21		0·2		
11/III	e P	8	34	24				7375	
	i		37	12					
	e S		41	45					
	i		43	12					
	L		44	5					
	M	9	54	22	18		0·3		
14/III	P	20	50	12				8955	Akita, Japan.
	S		9	20					Akita P 19 58 42
	L		19						Kinka-zan " 59 26
	M		38	40	15		4·5		Osaka, " 20 2 3
			54	24	15		4·4		Nagasaki, " 51, Δ 500k.
			56						Irkutsk, " 6 58, 3000
									Ottawa. " 12 24, 10200
18/III	P	4	30	12				7800	Osaka. P 4 26 10.
	S		39	22					Irkutsk. " 59
	L	5	0	42					Otomari " 23 57
	M		12	45	18		0·9		Mito " 25 33
	F		18	10	17·5		0·8		Nagasaki " 27 17
		6	9	0					Manila " 29 15
18/III	P	6	26	36				8550	Otomari P 6 21 26
	S		36	24			0·9		Osaka, " 6 23 35, Δ 3180.
	L		57	0					Irkutsk. " 24 9 4050.
	M	7	7	15	25		0·8		
	F		17	40	10		1·4		
			55						
20/III	P	23	1	36				11870	Osaka, P 22 51 37
	S		13	20					Irkutsk, " 55 41, Δ 3035
	L		36	20					Mizusawa " 49 58
	M		44	12	18·5		0·25		Zi ka wei " 53 53
21/III	P	7	34	30				3910	
	S		40	12					
	L		52	55					
	M	8	55	5	10		0·4		

Date 1914	Phase	GREENWICH MEAN TIME h	m	sec	Period T sec	Amplitude of N mm	Amplitude of W mm	Distance Δ Km.	Notes.
22/III	P	6	13	0				10975	
	S		24	40					
	L		46	40					
	M		54	0	27		0·2		
24/III	P	16	19	0				9150	
	S		29	18					
	L		47	24					
	M		50	36	24		0·5		
27/III									Not running.
28/III	P	10	56	30				8375	Irkutsk, P 10 50 34, Δ 3030.
	S	11	6	9					Osaka, 53 19
	L		26	5					Zi ka wei 49 43
	M		27	24	17·5		2·0		
			28	30	18·5		2·0		
	F	12	10						
30/III	P1 S	0	53	23			0·6	7355	Irkutsk, e, 0 55 39
	P2		58	36				7390	" P1, 1 0 12, Δ 8250 k.
	S1	1	2	10					
	S1 N			45			0·9		
	P3 S		3	10			1·1	7175	Irkutsk, P2, 1 5 58, Δ 8300 k.
	S2 N		7	25					Ottawa, P 0 47 46, Δ 3800 k.
	S3 N		11	48					S. Fernando, 53 0
	L1		18	15					Bidston, 53 30
	M1		19	18	18		2·6		
	L2 S		22	54			1·2		
	M2		25	2	17 ×		2·8		
			27	27	22		3·6		× distorted.
				40	21		3·6		
	L3		28	57			1·7		
	M3		31	54	22		2·8		
			36	0	17		2·0		
			41	24	15		2·2		
			46	24	14		1·9		
			49	20	14		1·3		
			57	40	14		1·7		
		2	3	0	15		0·4		
	F		13	12	20				
			56						
9/IV	P	4	8	51				11550	Ottawa, P 4 5 34, Δ 9600.
e	S		20	54					Zi ka wei " 3 56 24
	L		45						
	M	5	3	30	26		0·1		
11/IV	e P	16	52	38				Ca. 17000	
	e S	17	8	45					Osaka, P 16 39 41, Δ 5735
	e L		40	0					Taihoku, P 44·9, Δ 6817
	e M		46	30	28		1·0		Ottawa, ?eP 41 9
			59	12	24		0·9		Irkutsk, eP 42 27 Δ 8900
		18	5	0	20		1·1		Valetta P 51 57
	P?		6	58					Ottawa P 18 4 6 Δ 6100
	M		21	50	23		0·7		
			31	48	19		0·8		
	F	19	8	30					
20/IV	e P 1	13	40	3				8855	Ottawa, P 13 37 38·5 Δ 4450
	e P 2		42	42				8675	N 39 15
	e S 1 N		50	6			0·65		S 43 51
	e S 2 N		52	36			1·3		SR 46 32
	L 1	14	4	12					
	L 2 ?		6	50					
	M		9	15	30		0·2		
			12	24	19		0·7		
			13	50	17		0·65		
	F		27	54	17		0·3		
			48	30					
24/IV	M	9	20	6	13		0·6		Ottawa, eP 8 45 52 Δ 3500

DATE 1914		PHASE		GREENWICH MEAN TIME h	m	sec	PERIOD sec	AMPLITUDE OF N mm	OF W mm	Δ km	NOTES.
2/VI		P		8	6	49				315	
		S			7	24					
		L				47					
	i	M			8	35					
					9	6	4		0·8		
20/VI	e	P		7	40	15				15000	
	e.i.i	S			54	18					Osaka, P 7 30 8, Δ6485
		L		8	0	0					Taihoku, iP 35
					4	48					Ottawa P 39 0, Δ10400
		M			35	45					S. Fernando, P 40 0
					44	3	18		0·3		
23/VI	e	M		4	11	48					
					12	20			0·1		
25/VI	e	P		19	20	23				9935	Taihoku, iP 19 14 6, Δ2898
		S			31	18					Nagasaki iP 15 44, Δ4770
					32	8	8		0·35		Osaka, P 16 19, Δ5500
					35	44	10		0·7		Ottawa, e 26 45
		L			54						
		M			57	18	32		1·15		
					59	9	19		1·3		
		C		20	11	24	25		0·3		
		F		21	12	20	25		0·6		
						24					
26/VI		P?		4	29	15				10340?	S. Fernando, 4 37 0
		S?			40	24					
		L			56	0					
		M		5	5	54	18		0·03	8245	Taihoku, e 4 58 25·9
		P		5	8	12					osake, P 5 0 15, Δ=7375
		S			17	44					
		L			36	15					
		M			40	0	17		0·05		
		P		5	30	0				9600	
	e.i.i	S			40	40					
		L			41	21	6				
		M		6	5	39					
					19	45	18		0·25		
				6	40	15					Osaka, P 6 02 42
					49	12	21		0·03		Ottawa, P 6 12 52
27/VI	e	P		16	24	53				780	
	e	S			26	18					
	i	L			27	11					
		M				43	6		1·0		
					29	45	6		0·9		
4/VII	i	P		18	0	42				10225	Nagasaki, P 17 49 35, Δ 387
		S			11	50					Taihoku, 50 6·4, Δ 672
6/VII	i	S		7	0	48					Taihoku, P 6 37 46, Δ 124
		M			25	21	18		0·1?		(Karenko, Formosa).
17/VII	i			15	55	55					
		M		16	20	36			0·5		
3/VIII	i	P?	N	11	34	45					
	i		N		50	21					
		L		12	5	30					
		M			18	36	15		0·2		
5/VIII	i		N	10	46	40					
		L		11	8	0					
		M			11	45	18		0·05		
					19	50			0·07		

DATE 1914	PHASE		GREENWICH MEAN TIME h.	m.	sec	PERIOD sec	AMPLITUDE OF N mm	AMPLITUDE OF W mm	Δ. km	NOTES
28/IV	e	P	12	22	15				1800	
	e	S		25	20					
				29	15					
		M		30	0	13		0·25		
				37	18	14		0·15		
		F		41						
29/IV	e	P	4	17	1.8				2850	Ottawa, 4 13 32, Δ1730.
	i	N		18	45					
				21	50					
		S		30						
		M		31	55	12		micro		
29/IV		M	9	33	45	13		0·1?		
1/V	e		7	3	36					S. Fernando, S 6 51 0.
		M		21	33			0·15		
		F		41	30					
9/V		M	1	41	40	18		0·05		Osaka, P 0 44 54
15/V		M	20	49	36	18		0·03		Ottawa, P 19 54 22
26/V	e1		14	39	59					
	e2			42	7	21				
	i	P1	N	43	16	8		0·07	12030	Taihoku, iP 14 29 21·6, Δ3009
			S		26			0·7		Nagasaki, iP 46 Δ4135
		P2		46	12				12055	Osaka, P 56 Δ4100
		P3	S	48	39	10 - 12		0·7	12055	Irkutsk, P 32 55 Δ6790
		M of P		50	12	10		1·1		Ottawa, e 42 3
		P4		51	15				12030	Stonyhurst, iP 43 18
		S1	N	55	38	10		1·4		
			S	57	48	9		1·0		
		S2		58	35					
		S3		15 1	2					
		S4	N	3	37	9		2·0		
		M of S		3	58	9		6·3		
		"		8	13			4·7		
		L1		15	40					
		L2		18	36	34		3·5		L2 distorted.
		M2		20	30	25		7·4		
		L3		21	22					L3 not distorted.
		M3		23	30	30		8·7		Intermaximal lull, 15 26 21, (0-9 m.m.)
		L4		24	20					
		M4		32	25	21		7·8		
				34	17	18·5		9·7		
				37	16	18		10·2		
					53	18·5		10·6		
				39	22	17		13·3		
				45	0	19		7·3		
		C	16	5	3	15		1·3		
				10	0	20		0·8		
				13	30	20		0·8		
		M'		35	57	20		1·2		Irkutsk, M'1 16 49 4
				42	0	21		0·8		
		C'	17	19	45	20		0·1		
		M"	18	20	24	25		0·05		Irkutsk, M"1 18 4 42
				45	39	21		0·05		
		C"	19	35	40	28		0·03		
		F	20	15						
28/V	i	P	3	35	12					Ottawa, P 3 31 9, Δ3800
		M	4	7	48	21				
28/V		P	19	3	9					
		M		22	28					
31/V	i	P	S	14	0	32				Ottawa, P 13 55 0, Δ2300
		L?			27	21				
		L			36	24				
		M			44	18	17		0·1	

DATE 1914	PHASE	GREENWICH MEAN TIME h	m	sec	PERIOD T sec	AMPLITUDE OF N mm	OF W mm	Δ km.	NOTES.
8/VIII	P?	19	20	12					
	i		22	57					
	L N		35	21					
22/VIII	i P S	5	39	20			0.04	2800	
	i		43	48					
	e	6	4	40					
	M		12	24	10		0.2		
	S		26	18	13		0.1		
	F		49						
22/VIII	e	15	19	55					
	M	16	12						
			20	0	18		0.05		
			25	54	20		0.05		
28/VIII	P	8	47	0					
	S		57	28					
	M	9	18	00					
			28	0	19		0.5		
2/IX	e	20	47	18					
	e		55	28					
	P	21	14	12					
	S		22	15			0.05		
17/IX	e	13	10	51	4				
	i N		14	40	8		0.65		
	S		17	40	10		0.3		
	M		18	25	10		1.4		
1/X	e	6	35	24				7965	Ottawa, P 6 31 8, Δ 4200.
	e		44	42					
	P		59	24					
	S	7	6	45					
3/X	i	17	32	36	8			5775	Ottawa. P 17 28 39, Δ 3420
	i N		40	0	10		0.8		
	S		47	12	28		6.4		
	M		52	2	11		12.0		
			53	6	10		3.3		
	C	18	6	51	10		0.7		
			11	15	14		0.3		
	F	19	43	12	18		0.2		
			15	26	13.5				
3/X	i P N	22	12	44				3110	
	i S S		17	45			2.2		
	M.o(S N		18	20			26.0		
	i L N		19	? 35					
	M		21	33			36.0		
			25	0			36.0		
			26	48			72.0		
			31	39			25.0		
			33	21			16.4		
			36	0	10		8.2		
			36	55	11		7.4		
			37	22	13		6.3		
			38	46	10		4.9		
			39	39	12		4.0		
			40	31	9		4.1		
			42	21	11		4.4		
			43	18	11		3.1		
			45	5	8		2.3		
				39	11		2.5		
			46	36	10		2.7		
	C		49	12	12		2.1		
			50	30	11		1.8		
			57	50	13		0.8		
	F	23	50						

DATE 1914	PHASE	GREENWICH MEAN TIME h	m	sec	PERIOD T sec	AMPLITUDE OF N mm	AMPLITUDE OF W mm	Δ km.	NOTES.
6/X	P	19	45	30				ca. 17000	Nagasaki, e 19 44 26
	S	20	1	40					
	L		42						
	M		56	20	25		0·3		
		21	4	0	22		0·05		
9/X	e P	2	47	48				6385	Taihoku, e 2 43
	S		55	45					
	L	3	11	5					
	M		13	0	15·5		0·35		
			17	2	17		0·35		
	F	4	7						
17/X	e P	6	27	22				2230	Barcelona, P 6 26 22
	i P		28	14	4		0·25		
	S		31	6					
	N S		34	3					
	M		35	10	10		12·7		
			36	48	11		26·2		
			37	45	10		16·3		Intermaximal lull, 6 38 12 (0·6 mm.)
			38	31	11		4·8		
			39	19	10		4·9		
			40	?21	?		4·0?		Under fastening band.
	C		42	15	10		1·1		
	F		43	22	9		1·3		
		7	1						
17/X	e P	10	45	10				2500	
	i P		49	15					
	S		54	26					
	N M		55	0	13		1·4		
			56	58	12		1·1		
			57	50	10		0·9		
23/X	e P	6	33	42				10755	Mindanao.
	i P		45	13	8		0·6		Taihoku, P 6 23 51, Δ 2148
	S		53	15	15		1·1		Nagasaki, P 6 24 44, Δ 2520
	S	7	13	25					
	L		14	58	33		0·4		
	M		16	39	27?		1·0		
			18	40	29		0·9		
			22	48	25		1·0		
			27	31	20		1·2		
			33	15	20		0·4		
	C		51	0	18		0·2		
	F	8	15						
26/X	P	3	44	39				1150	Barcelona. P 3 44 42
	S		46	42					
	L		47	42			1·8		
	M		48	18	6		3·3		
			49	16	8		1·6		
			50	0	7		1·1		
				45	5				
	F		57	24					
27/X	P	9	25	22				1080	
	i P		27	18					
	S		28	45					Intermaximal lull, 9 29 48 (0·1 mm.)
	L			50	8		1·7		
	M		30	12	7		1·65		
			31	15	6		1·35		
				40			1·35		
	F		52	24					
28/X	P	1	6	22				8165	
	S		15	50					
	L		37						
	M		47				0·2		

DATE 1914	PHASE	GREENWICH MEAN TIME h	m	sec.	PERIOD T sec	AMPLITUDE OF N mm.	AMPLITUDE OF W mm.	Δ km.	NOTES.
18/XI	M	10	32	24	19		0·03		Ottawa, P 9 46 14. Δ 5030.
24/XI	P1	12	4	47				8700	Nagasaki, P 11 57 5, Δ 1740
	P2		9	17				8855	
	i S1 s		14	42					
	S2		19	20			1·0		
	L1		40	19					
	M1		43	21	37		0·4		
	L2		44	27					
	M2		46	39	19		0·7		
			49	15	22		0·65		
			54	21	21		0·7		
	C	13	7	45	19		0·3		
	F		15	21	17		0·25		
			45						
27/XI	P	14	42	49				2100	
	S		46	21					
	L		48	38					
	M		49	36	12		7·0		Intermaximal lulls:-
			50	2			6·3		14 50 24 (0·7 mm)
				45			6·35		
			51	3			5·5		52 0 ?
			52	15			5·9		
			53	0			8·8		53 48 (0·7 mm)
			54	15			2·8		54 21 ?
			55	21			3·0		
			56	45			2·0		
			57	49			1·7		
			58	27			1·7		
	C	15	1	18			1·2		
	F		11	45					
28/XI	P	10	57	30				9125	Nagasaki, P 10 46 28, Δ = 340.
	S	11	7	47					
	L		31	15					
	M		36	30	20		0·2		
			42	30	17		0·4		
28/XI	M	14	10	36	18		0·05		Not running well in Dec.
3/XII	P?	0	18	20					
14/XII	P	10	1	37				10635	
	i S s		12	3					
				38					
	M		33	0					
			39	48	20		0·3		
15/XII	M	10	14	45			0·1		
			30	25					
20/XII	M	14	50	25					
23/XII	P	23	19	49				2000	
	S		23	12					
	L		27	54					
	M		28	12	7		0·7		
				42	6		0·6		
			29	38	7		0·7		
	F		46						
24/XII	M	1	7	48	20		0·3		
27/XII	P	0	2	24				6110	
	S		10	6					
	L		21	21					
	M		26	45	13		0·7		
	F	1	4	18					