近地地震における表面波の観測について（つづき）*

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550.341

Observation of Surface Waves of the Near Earthquakes (the second paper)

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To prove our statement in the previous report, we investigated earthquakes (2) and (3) of Table 1 in the same manner as before.

§ 1. 筆者らはさきに Tab. 1 の地震(1)について，松代の地震動の軌跡を描いて調査し，ラブ波と推定されるものを観測したことを説明した．その説明で事柄は尽されているのであるが，かような観測は，おそらく，あまり例のないことと思われるので，単に一つの地震だけでは不満足であると考え，Tab. 1 の地震 (2), (3) についても地震 (1) と全く同様の取扱をした．本報告では，これら地震についての記象図および表などの材料と調査結果だけを列記するにとゞめるから，不明の事柄があれば，前の報告を参照されたい．

Tab. 1. Data of earthquakes (i)

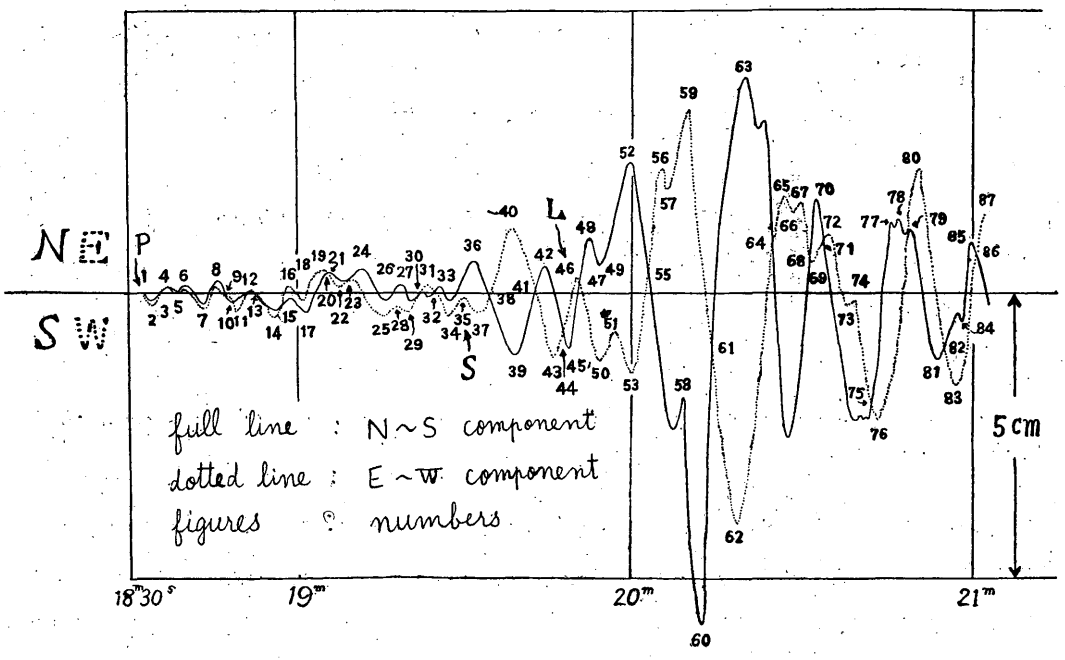
No.	Time of Occurrence 1952					Hypocentre				*S—P*	*L—P*	
						ϕ	λ	h	Δ			
	m	d	h	m	s			km	km	s	m	s
1	10	27	03	03	21.8	39.°4 N	143.°8E	40ca.	556	57.9	1	19.7
2		27	12	18	32.6	39.°5	143.°0	50～60	532	56.3	1	16.8
3	11	1	01	38	33.9	39.°1	143.°8	60ca.	570	56.4	1	16.4

§ 2. Tab. 1. の地震 (2) および (3) による松代の地震動

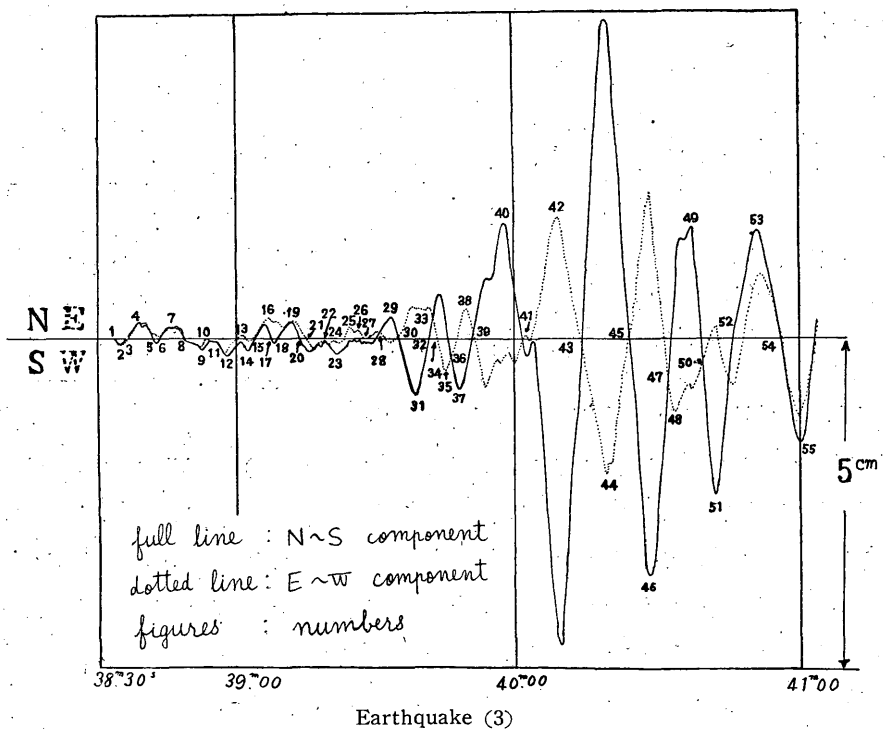
Fig. 5. は同一タイムの軸上に描いた三陸沖地震 (2) および (3) の松代における記象である．この図の波の極大あるいは交点に当る変位ならびにそれらの時刻を読取り，Tab. 4 および Tab. 5 としてかかげた．Fig. 6 および Fig. 7 は Fig. 5, Tab. 4 および Tab. 5 から描かれたものである．この図から Tab. 6 に示すような結果が得られた．Fig. 8 は地震 (2), (3) の走時曲線である．震源から L 波が発生するものとみて松代までの平均速度を求めた．その結果も Tab. 7 に記入した．結論については前号をみていただきたい．

* Received Sept. 4, 1954

** 松代地震観測所



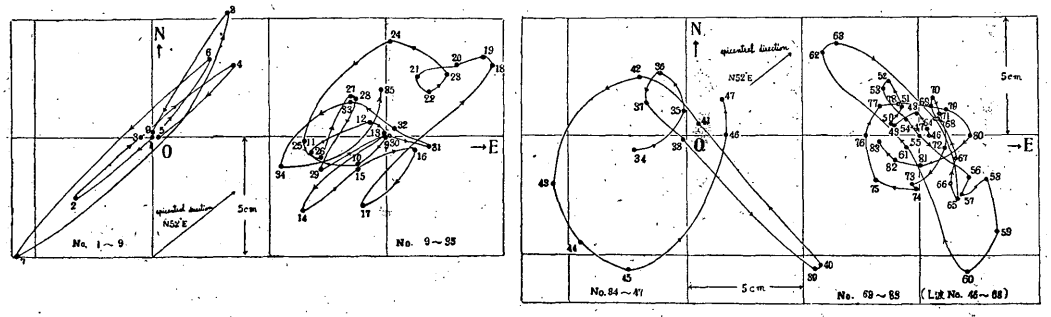
Earthquake (2)



Earthquake (3)

Fig. 5. Matsushiro seismograms of earthquake (2) and (3) in Tab. 1, off the coast of Sanriku district, recorded by a 1 ton seismograph of C.M.O. type (natural period : T_N = 31.6sec, T_E = 28.2sec). Records of two horizontal components were reproduced on the same axis of time

Fig. 6. Loci of ground motions observed at Matsushiro Seismological Station due to the earthquake (2) in Tab. 1, off the coast of Sanriku district



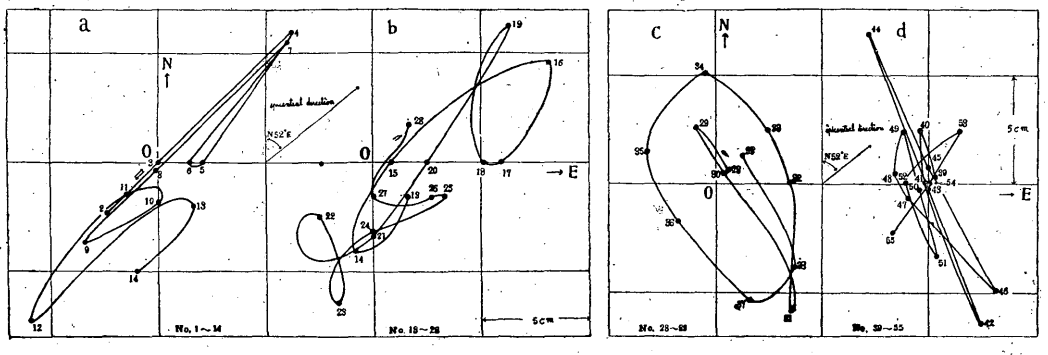
a. *P* wave (magnification : 25×original seismogram), amp. : 16μ (No. $\overline{2,4}\times 1/2$), period : 5.5sec (No. 1～5), direction of motion S 52°W

b. Intermediate part (magnification : 10 × original seismogram)

c. *S* wave (magnification : 5×original seismogram), amp. : 103μ (No. $\overline{36,40}\times 1/2$), period : 12.9sec (No. 35 ～ 41), direction of motion N 45°W

d. *L* wave (magnification : 1×original seismogram), amp. : 548μ (No. $\overline{60,62}\times 1/2$), period : 21.7sec (No. 55 ～ 64), direction of motion : N 33°W

Fig. 7. Loci of the ground motions observed at Matsushiro Seismological Station due to the earthquake (3) in Tab. 1, off the coast of Sanriku district



a. *P* wave (magnification : 20×original seismogram), amp. : 30μ (No. $\overline{2,4}\times 1/2$), period : 8.1sec (No. 1～5), direction of motion N 45°E

b. Intermediate part (magnification : 17 × original seismogram)

c. *S* wave (magnification : 5×original seismogram), amp. : 90μ (No. $\overline{29,31}\times 1/2$), period : 11.5sec (No. 28～33), direction of motion N 37°W

d. *L* wave (magnification : 1×original seismogram), amp. : 694μ (No. $\overline{42,44}\times 1/2$), period : 22.0sec (No. 41 ～ 45), direction of motion : N 22°W

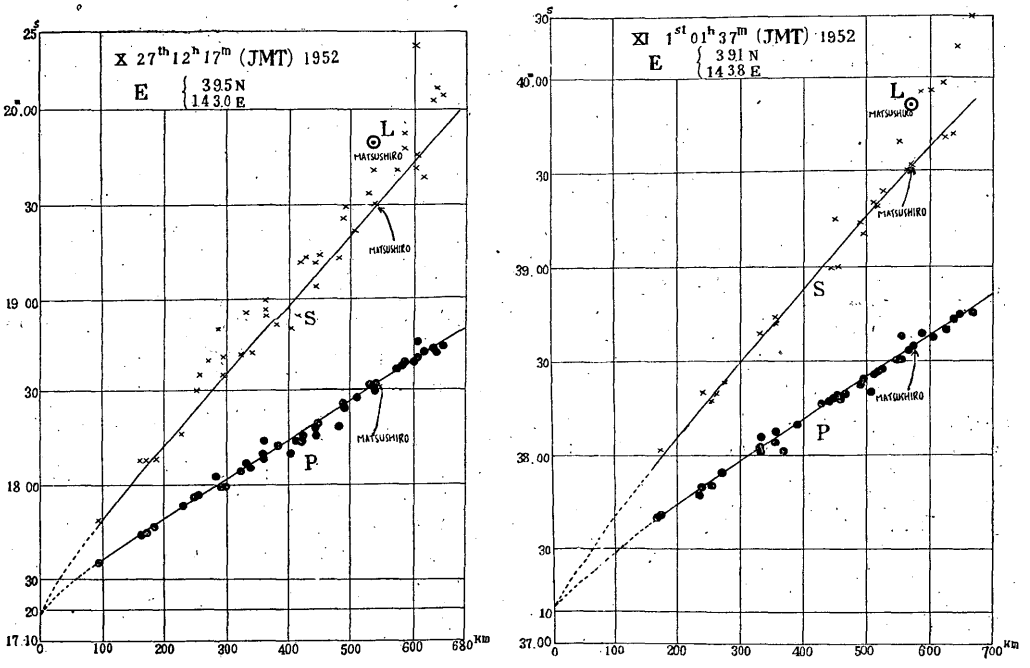


Fig. 8. Travel time curves of earthquakes (2) and (3) in Tab. 1

Table 4. Displacements and corresponding time of the seismogram of the earthquake (2) in Table 1, recorded at Matsushiro (cf. Table 2)

No.	Displacement N	Displacement E	Time	No.	Displacement N	Displacement E	Time	No.	Displacement N	Displacement E	Time
	mm	mm	m s		mm	mm	m s		mm	mm	m s
1	0	0	18 32.6	21	+ 2.5	+ 1.3	19 07.1	41	+ 1.0	+ 1.0	19 41.8
2	− 1.0	− 1.3	34.0	22	+ 1.8	+ 1.8	08.1	42	+ 5.0	− 4.0	43.2
3	0	− 0.2	35.4	23	+ 2.6	+ 2.6	09.6	43	− 4.0	−11.4	45.3
4	+ 1.2	+ 1.4	36.6	24	+ 4.1	+ 0.2	11.4	44	− 9.0	− 9.0	46.7
5	0	+ 0.1	38.1	25	− 0.2	− 3.5	14.1	45	−10.2	− 5.0	47.2
6	+ 1.3	+ 1.0	40.4	26	− 0.9	− 2.8	14.9	46	0	+ 3.4	49.4
7	− 2.0	− 2.3	43.2	27	+ 1.7	− 1.5	17.2	47	+ 3.0	+ 3.0	50.0
8	+ 2.1	+ 1.4	44.9	28	+ 1.6	− 1.3	17.6	48	+ 9.3	− 1.0	51.2
9	0	0	47.0	29	− 1.4	− 2.8	19.6	49	+ 4.1	−11.0	52.9
10	− 1.2	− 1.2	48.1	30	0	0	21.9	50	+ 5.0	−12.0	53.6
11	− 0.7	− 3.2	49.1	31	− 0.4	+ 1.9	23.0	51	+12.0	− 6.8	55.6
12	+ 0.6	+ 0.7	50.6	32	+ 0.4	+ 0.4	24.1	52	+22.8	−13.0	58.6
13	0	0	51.9	33	+ 1.5	− 1.5	24.8	53	+20.0	−15.0	59.6
14	− 3.1	− 3.6	56.2	34	− 1.2	− 4.5	26.6	54	+ 6.1	− 5.3	20 01.6
15	− 1.2	− 1.2	57.3	35	+ 2.0	− 0.2	28.9	55	0	0	01.9
16	− 0.5	+ 1.3	58.4	36	+ 5.3	− 2.3	30.7	56	−17.0	+21.2	04.8
17	− 3.0	− 1.0	19 01.5	37	+ 2.8	− 3.4	32.6	57	−25.0	+17.5	06.9
18	+ 3.0	+ 4.5	04.6	38	− 0.3	− 0.3	33.9	58	−17.6	+28.0	08.6
19	+ 3.3	+ 4.1	05.3	39	−11.2	+11.0	37.6	59	−40.0	+32.0	09.6
20	+ 3.0	+ 3.0	06.1	40	−10.8	+11.6	38.2	60	−56.9	+20.0	11.1

No.	Displacement N	Displacement E	Time	No.	Displacement N	Displacement E	Time	No.	Displacement N	Displacement E	Time
	mm	mm	m s		mm	mm	m s		mm	mm	m s
61	− 5.0	− 5.0	20 13.6	71	+ 8.5	+ 8.5	20 32.8	81	−12.9	0	20 53.0
62	+35.0	−41.0	18.2	72	− 5.0	+10.5	34.5	82	−10.0	−10.0	54.3
63	+88.6	−35.0	19.5	73	−20.0	− 2.3	37.6	83	− 2.6	−17.0	56.5
64	+ 7.0	+ 7.0	24.6	74	−21.8	− 1.0	38.6	84	− 4.2	−12.0	57.7
65	−25.6	+16.0	27.3	75	−19.0	−19.0	41.4	85	+ 9.2	− 3.0	59.6
66	−20.0	+12.8	28.1	76	0	−22.9	42.6	86	+ 7.0	+ 7.0	21 00.4
67	−10.0	+15.0	29.2	77	+12.2	−17.0	44.4	87	0	+13.0	01.6
68	+ 7.0	+ 7.0	30.6	78	+13.0	− 8.0	45.8				
69	+13.0	+ 5.0	31.0	79	+10.9	+10.9	48.1				
70	+16.6	+ 5.5	31.7	70	0	+21.6	50.0				

Table 5. Displacements and corresponding time of the seismogram of the earthquake (3) in Table 1, recorded at Matsushiro (cf. Tab. 2)

No.	Displacement N	Displacement E	Time	No.	Displacement N	Displacement E	Time	No.	Displacement N	Displacement E	Time
	mm	mm	m s		mm	mm	m s		mm	mm	m s
1	0	0	38 33.9	21	− 2.0	0	39 14.5	41	0	− 1.0	40 02.0
2	− 1.2	− 1.2	35.3	22	− 1.5	− 1.5	18.5	42	−65.5	+25.0	09.0
3	0	0	36.7	23	− 3.9	− 1.0	21.0	43	− 0.5	− 0.5	14.0
4	+ 3.0	+ 3.1	39.0	24	− 1.9	0	22.4	44	+67.0	−29.0	19.0
5	0	+ 1.0	42.0	25	− 1.0	+ 2.0	23.5	45	+ 6.0	0	24.0
6	0	+ 0.7	43.5	26	− 1.2	+ 1.6	25.3	46	−50.0	+31.0	28.2
7	+ 2.8	+ 3.0	45.5	27	− 1.0	0	27.0	47	− 8.0	− 8.0	32.5
8	− 0.1	0	48.7	28	+ 1.0	+ 1.0	30.3	48	+ 4.2	−16.0	33.6
9	− 1.8	− 2.4	52.5	29	+ 5.0	− 1.8	32.8	49	+23.8	−11.0	37.4
10	− 1.0	0	53.4	30	+ 8.0	+ 8.0	34.6	50	− 4.0	− 4.0	39.8
11	− 0.8	− 0.8	55.8	31	−11.9	+ 7.0	38.0	51	−34.0	+ 2.8	42.2
12	− 3.8	− 3.0	57.7	32	+ 7.0	0	40.8	52	0	−11.0	45.0
13	− 1.0	+ 0.8	39 0.6	33	+ 4.8	+ 4.8	41.5	53	+23.8	+14.0	51.0
14	− 2.5	− 0.5	2.4	34	+ 1.0	− 1.0	42.6	54	0	0	56.5
15	0	+ 0.5	3.8	35	+ 2.8	− 6.5	44.2	55	−23.0	−16.5	59.9
16	+ 2.8	+ 4.9	6.6	36	− 3.6	− 3.6	45.9				
17	0	+ 3.5	7.9	37	−11.0	+ 3.0	47.5				
18	0	+ 3.1	9.2	38	− 8.0	+ 7.0	48.4				
19	+ 3.8	+ 3.8	11.6	39	+ 2.5	+ 2.5	50.3				
20	0	+ 1.5	13.3	40	+24.0	− 4.0	57.0				

Table 6. Data of earthquake (iii) ((2) : 12^h, Oct. 27, (3) : 01^h Nov. 1)

Earth-quake	Amplitude (2)	Amplitude (3)	Period (2)	Period (3)	Direction of motion (2)	Direction of motion (3)	Angle between direction of motion and azimuth of epicentre from observatory (N52°E) (2)	Angle between direction of motion and azimuth of epicentre from observatory (N52°E) (3)	Initial displacement (2)	Initial displacement (3)
	μ	μ	sec	sec			°	°	μ	μ
P	± 16	± 31	5.5	7.2	S 52°W	S 45°W	0	7	15	16
S	± 103	± 93	12.9	11.3	N 45°W	N 29°W	97	81	20	50
L	± 548	± 665	21.7	21.2	N 33°W	N 28°W	85	80	270	230

Table 7. Data of earthquake (iv). Velocity and period of L wave

Earthquake	Velocity	Half periods measured succesively				Period of elliptic motion followed S wave
	km/sec	s	s	s	s	s
(1)	3.51	12.0	13.4	10.1	7.9	8.8
(2)	3.53	12.5	11.7	11.0	6.0	7.6
(3)	3.57	12.8	11.1	10.1	8.2	8.8
mean	3.54	12.4	12.1	10.4	7.4	8.4

Table 8. Data of earthquake (v). Amplitude ratio of P and S waves to L wave

Earthquake	a (P wave)	b	c (S wave)	d (L wave)
(1)	1/48	1/19	1/6	1
(2)	1/25	1/10	1/5	1
(3)	1/20	1/17	1/5	1

(cf. Fig. 2, 3, 5, 6 and 7)