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11. *Observation of Aftershocks of the Niigata Earthquake of June 16, 1964.*

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(Read July 14 and Sept. 22, 1964.—Received Jan. 26, 1968.)

1. Introduction

A destructive earthquake struck Niigata City and surrounding regions on June 16, 1964. According to the Seismological Bulletin of the Japan Meteorological Agency (JMA),[1] the origin time was $13^h01^m39.9^s \pm 0.1^s$ JST (GMT$+9^h$), June 16, 1964, the epicenter was at $38°21' \pm 00'$N and $139°11' \pm 00'$E, about 20 km off the coast of Niigata Prefecture, the northern part of central Honshu, Japan, the depth of the focus was 40 km and the magnitude was 7.5.

At the news of the earthquake, several parties were dispatched for aftershock observation from the Earthquake Research Institute in cooperation with the International Institute of Seismology and Earthquake Engineering.

The locations of observation points, the instruments used and the periods of observation are read in Table 1 and the distribution of the observation points are shown in Fig. 1. The characteristics and the magnification curves of the instruments are given in Fig. 2.

Since the epicenter of the main shock was located in the sea, an observation point was set up on a small island, Awashima, 13 km distant from the epicenter of the main shock, in addition to three observation points in Honshu (the main land).

At Awashima, an accelerograph was installed on June 21 and a high magnification electromagnetic seismograph "HES 1-0.2" was installed on July 4. The observation was obliged to be limited to only four hours a day in the beginning, as electric power was supplied only in the evening on that island. But later the HES 1-0.2 seismograph was operated all day by electric power supplied by the courtesy of the Awashima Kanko Hotel.

1) The Seismological Bulletin of the Japan Meteorological Agency for June, 1964. (1965).

Table 1. Temporary

Code	Location	Latitude	Longitude	Geology
AW	Awashima	38° 27′ 41″ N	139° 15′ 12″ E	Tertiary
MU	Murakami	38° 12′ 57.1″ N	139° 30′ 21.7″ E	Tertiary
SH	Shibata	37° 58′ 20.3″ N	139° 23′ 18.6″ E	Granite
OG	Oguni	38° 03′ 14.6″ N	139° 44′ 52.6″ E	Tertiary

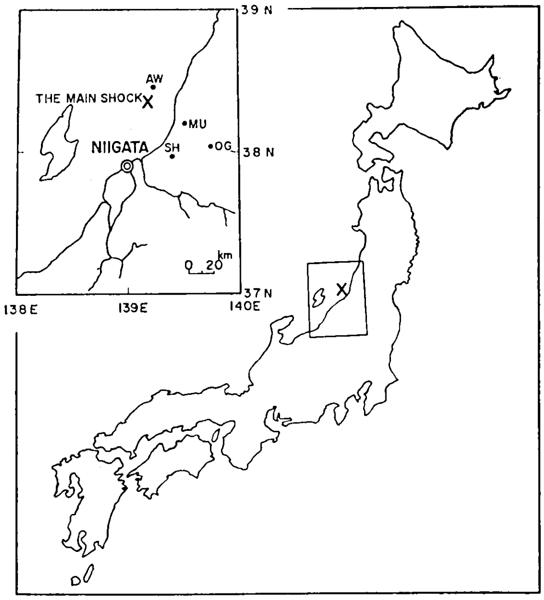

Fig. 1 Distribution of the temporary observation stations.
×: Epicenter of the main shock

At the other three observation points, the HES 1-0.2 seismographs were operated continuously. Crystal clocks were used at every observation point and were calibrated by the JJY standard time signals once or twice a day, so as to keep the time accuracy within ±0.1 sec.

The members who participated in the field observation were

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The members engaged in the interpretation and analysis of the seismograms were

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Observation Stations

Period of observation	Seismograph				
	Name	Component	T_1	T_2	V_{max}
June 21~July 9	Accelerograph		0.1		200 (Sensitivity 2.2 mm/gal)
July 3~July 9	HES 1-0.2	Z, N, E	1.0	0.2	10,000
June 22~July 11	HES 1-0.2	Z, N, E	1.0	0.2	50,000
June 20~July 11	HES 1-0.2	Z, N, E	1.0	0.2	50,000
June 23~Aug. 1	HES 1-0.2	Z, N, E	1.0	0.2	50,000
		Z	1.0	0.2	5,000

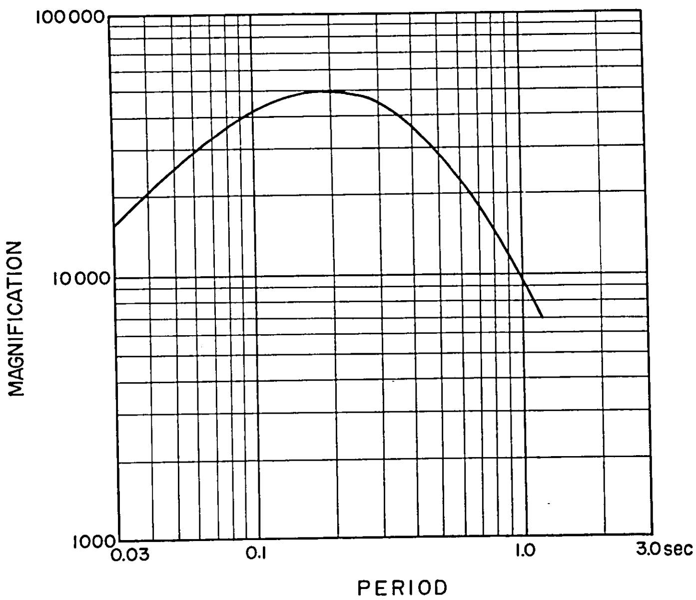

Fig. 2 Response of HES 1-0.2* seismograph.

T_1	T_2	h_1	h_2	σ
1.0 sec	0.20 sec	1.0	1.0	0.20

* Hagiwara Electromagnetic Seismograph. Annexed numbers indicate the approximate periods (in seconds) of the pendulum and the galvanometer. Micro-film recording system is adopted. Film speed is 20 mm/min. The magnifications on the film reader are shown, as the seismograms are read off with the film reader (×8). The curve shows the case of the maximum magnification $V_{max}=50,000$.

2. Frequency of aftershocks.

The high magnification seismographs at each station recorded great numbers of aftershocks, in spite of the fact that four to seven days

Table 2. Hourly frequencies of aftershocks observed with HES 1-0.2 at
(a) Awashima
(b) Murakami
(c) Shibata
(d) Oguni.

n: number of the hours when the observation was carried out without interruption.
N*: frequency of the aftershocks observed.
N**: frequency of the aftershocks observed in n hours when the observation was not interrupted.
N(24): reduced daily frequency of the aftershocks, i.e. (24/n)N**.
N(24)*: twice the frequency of the aftershocks observed from 20 h to 08 h in the next morning.

Table 2 (a)

Awashima

	July 4	5	6	7	8	9	10
0 h		11	12	14	10	7	7
1		9	7	10	11	11	4
2		6	13	8	9	9	5
3		9	12	12	4	5	11
4		11	7	10	5	5	10
5		12	10	13	4	8	1
6		10	9	10	6	7	7
7		7	5	8	7	9	7
8		6	7	7	(2)	2	9
9		5	2	5		1	6
10	6	8	5	6		5	8
11	5	7	3	2	10	4	8
12	3	18	10	4	8	5	5
13	5	12	3	5	13	4	(3)
14	14	17	6	5	3	4	
15	12	14	6	6	10	1	
16	6	10	6	1	5	3	
17	7	10	3	3	7	2	
18	6	9	7	6	8	4	
19	2	5	4	4	7	8	
20	6	13	5	3	5	5	
21	5	9	7	3	3	6	
22	9	10	5	6	7	2	
23	10	4	8	4	9	6	
n	14	24	24	24	21	24	13
N*	96	232	162	155	153	123	91
N**	96	232	162	155	151	123	88
N(24)	165	232	162	155	173	123	162

Shibata

Table 2 (b)

	June 20	21	22	23	24	25	26	27	28	29	30	July 1	2	3	4	5	6	7	8	9	10	11
0 h		26	22	7	6	10	11	10	6	2	6	4	4	11	6		8	3	7	3	2	4
1		24	20	12	6	9	7	9	7	4	4	3	7	6	7		5	4	2	3	1	2
2		26	24	8	6	10	9	9	8	6	9	5	6	1	9		8	1	2	1	1	3
3		33	23	8	8	9	5	8	7	7	2	2	7	8	2		2	4	2	3	3	2
4		26	29	11	6	11	(5)	9	4	5	1	3	5	13	2		8	4	4	3	1	1
5		27	20	9	9	8		10	7	4	5	5	2	5	7		3	3	2	2	5	1
6		26	25	6	11	5		16	4	3	5	6	10	7	8		2	4	4	2	3	2
7		26	24	8	5	12		3	8	5	1	2	4	3	5		3	0	2	3	1	2
8		27	27	5	8	9		6	1	5	4	3	0	5	6		5	5	5	0	3	2
9		25	18	2	10	11		8	3	4	9	4	1	6	7		0	0	2	0	2	0
01		(9)			13	10		9	2	9	2	6	6	7			4	3	3	2	1	1
11		(3)			7	10		6	1	7	7	5	5	4			3	3	2	4	1	2
12		15	*	(1)	6	4		8	4	3	2	2	4	6		5	7	1	1	1	4	2
13		14			13	10		8		6	2	10	4	7		3	2	1	6	3	3	2
14		16			13	3		10		6	4	5	8	5		1	1	3	3	2	6	
15		15			10	10	(1)	4		9	8	3	7	9		5	10	3	3	1	1	
16		18	(8)	4	10	8	7	10	2	5	5	4	5	9		6	2	1	6	1	0	
17		21	12	10		12	11	4	5	4	2	3	4	10		6	0	10	3	1	2	
18	17	22	8	10	11	10	2	5	5	7	3	5	7	8		6	4	3	3	3	1	
19	29	22	5	6	19	16	4	12	5	6	5	3	6	9		7	6	3	1	5	4	
20	35	22	12	11	14	10	8	4	2	3	6	2	3	5		5	3	2	2	4	3	
21	26	19	8	11	12	15	9	12	4	2	9	3	3	0		3	6	4	1	3	5	
22	31	25	8	7	6	12	8	6	8	4	2	3	5	4		5	2	4	4	3	3	
23	34	22	6	19	11	10	7	12	3	6	5	8	3	3		6	2	3	2	2	4	
n	6	22	17	18	23	24	12	24	21	24	24	24	23	23	10	12	24	24	24	24	24	14
N*	172	509	299	155	220	234	94	198	96	122	108	99	116	151	59	85	96	72	72	55	60	26
N**	172	497	291	154	220	234	88	198	96	122	108	99	116	151	59	58	96	72	72	55	60	26
N(24)	688	542	411	205	230	234	176	198	110	122	108	99	121	158	142	116	96	72	72	55	60	45

* Observation point was moved.

Murakami

Table 2 (c)

	June 22	23	24	25	26	27	28	29	30	July 1	2	3	4	5	6	7	8	9	10	11
0 h		42	49	36	33	38				24	19	24	30		18	15	15	13	11	10
1		46	48	35	33	34				27	23	15	33		15	12	12	11	2	9
2		56	46	32	33	34				29	20	15	34		17	5	9	4	8	8
3		47	45	44	23	36				23	16	20	23		17	10	11	10	8	8
4		52	44	34	24	33				19	22	21	20		16	9	12	10	8	5
5		48	37	43	23	33				22	9	19	21		9	8	5	11	5	8
6		41	41	22	25	36				32	14	14	25		7	9	6	9	9	5
7		38	10	7	22	17			(1)	7	4	15	11		6	9	13	7	5	9
8		28	35	6	14	24			14	8	7	9	6	(5)	2	8	8	1	3	2
9		14	37		24	(16)		(2)	15	15	1	9	12	4	0	6	7	1	0	
10		24	44	19	4			13	10	10	5	9	8	6	3	5	16	5	6	
11		32	27	14	22			13	12	12	8	10	6	6	3	7	14	4	4	
12		36		16	19			8	14	7	5	8	11	13	7	9	13	4	3	
13		26	14	23	20			15	7	15	9	18	9	11	2	4	16	13	6	
14		18	26	11	8			23	8	7	12	7	12	5	1	5	8	7	8	
15		26	19	23	11			23	14	8	10	15	14	8	5	9	12	2	5	
16	(2)	39	20	23	13			23	13	13	11	19	5	10	3	5	8	6	1	
17	(8)	36	18	26	27			22	7	12	11	27	11	9	5	11	9	2	6	
18	37	37	38	27	24			25	15	14	12	27	7	15	9	7	14	6	9	
19	36	49	39	32	21			27	11	12	17	34	9	15	11	7	7	12	5	
20	45	39	13	27	25			27	23	11	15	25	(2)	12	11	11	11	8	12	
21	54	57	25	28	35			25	30	17	11	18		20	15	11	9	8	12	
22	48	43	43	37	39			30	21	14	19	20		19	8	10	11	10	11	
23	44	47	41	33	29			(5)	20	20	11	29		15	8	11	10	8	19	
n	6	24	23	23	24	9	0	13	16	24	24	24	20	15	24	24	24	24	24	9
N*	274	921	759	598	551	301	—	281	234	378	291	497	309	173	194	203	256	172	166	64
N**	264	921	759	598	551	285	—	274	234	378	291	427	307	168	198	203	256	172	166	64
N(24)	1056	921	792	624	551	760	—	506	351	378	291	427	368	269	198	203	256	172	166	171

Oguni

Table 2 (d)

	June 23	24	25	26	27	28	29	30	July 1	2	3	4	5	6	7	8	9	10	11	12
0 h		32	24	25	30	11	10	13	10	10	15	14	9	11	7	9	5	8	3	5
1		32	29	24	24	19	11	13	12	15	12	12	8	8	7	2	4	5	1	5
2		40	34	22	33	14	15	12	18	17	7	16	3	14	3	2	5	4	6	10
3		35	25	15	30	17	14	14	11	10	10	9	7	10	5	3	6	7	6	8
4		34	27	23	23	12	11	10	10	15	12	6	8	11	6	4	6	7	3	5
5		28	25	24	22	20	5	14	13	8	8	8	10	5	4	3	6	6	5	6
6		31	20	22	25	19	10	19	10	10	9	10	6	6	9	3	4	8	3	3
7		20	27	16	11	9	13	6	3	5	10	10	6	5	1	5	8	0	4	3
8		40	22	6	7	20	8	8	6	4	10	5	6	5	7	5	3	2	2	6
9		17	11	6	8	9	6	8	4	3	5	6	4	2	3	5	3	4	1	14
10		28	8	7	10	10	9	3	6	2	6	5	3	6	3	6	5	2	5	7
11		23	16	20	10	4	11	5	6	7	5	4	2	4	4	4	8	4	5	5
12		21	6	18	14	10	3	5	5	5	6	7	5	7	3	6	3	4	4	10
13		27	19	26	8	3	7	4	7	2	4	8	5	2	2	8	8	5	2	13
14		22	8	12	10	7	4	3	3	9	2	3	3	2	2	3	5	5	1	6
15		24	19	12	5	3	7	7	3	5	7	8	4	6	3	5	3	2	1	7
16	(5)	20	15	13	14	10	11	4	5	5	6	5	7	3	0	7	3	0	5	3
17	31	21	18	14	7	6	8	2	6	3	5	4	3	1	9	2	4	5	3	5
18	34	31	13	15	9	11	6	4	3	7	6	1	5	6	3	5	4	4	3	3
19	39	37	23	17	21	9	11	5	10	10	9	4	5	6	5	3	7	7	6	6
20	29	24	19	17	10	9	5	9	6	6	8	3	8	6	6	5	5	4	3	5
21	23	23	16	19	15	8	7	14	7	6	4	4	6	6	5	4	9	5	3	4
22	28	21	26	19	9	17	9	11	5	8	2	10	8	3	4	7	4	6	5	2
23	30	26	18	23	17	13	15	10	13	4	6	12	6	5	3	5	5	8	7	3
n	7	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
N*	219	657	468	415	392	270	216	203	182	176	174	174	137	140	104	111	123	112	87	144
N**	214	657	468	415	392	270	216	203	182	176	174	174	137	140	104	111	123	112	87	144
N(24)	734	657	468	415	392	270	216	203	182	176	174	174	137	140	104	111	123	112	87	144
N(24)*	724	610	500	572	344	272	274	262	242	214	210	172	196	124	98	130	136	108	126	80

(to be continued)

Table 2 (d) (continued)

	13	14	15	16	17	18	19	20	21	22	23	24	25	26	27	28	29	30	31
0h	6		1	4	2	3	5	6	3	3	3	5	3	2	1	1	2	5	6
1	1		6	5	7	4	2	1	2	2	6	4	4	6	3	4	7	4	3
2	4		3	5	4	2	2	4	6	6	3	4	1	2	3	2	5	8	6
3	4		5	7	2	6	2	1	4	10	3	3	2	3	4	1	3	4	3
4	3		5	6	4	3	2	2	4	1	4	2	3	2	1	5	6	6	2
5	3		4	9	9	4	1	1	3	8	5	1	4	5	3	4	1	6	3
6	5		4	3	4	8	7	2	5	4	3	4	2	1	1	3	3	4	3
7	0		7	1	4	3	3	2	3	4	5	1	2	1	6	5	3	0	0
8	4		4	4	5	1	2	4	2	0	2	2	2	1	3	2	4	3	0
9	1		5	0	1	5	0	1	3	2	0	2	2	2	0	0	1	0	1
10		1	1	2	6	4	0	6	0	0	0	2	1	3	2	0	4	4	1
11		3	3	3	6	1	3	5	2	1	1	2	1	1	0	0	1	5	3
12		9	3	14	3	2	3	1	3	2	3	4	2	5	3	1	1	1	2
13		6	3	5	4	3	5	2	1	2	3	0	0	1	1	1	2	0	2
14		3	4	4	2	1	1	8	5	0	1	0	1	1	1	0	1	1	1
15		3	5	1	3	2	3	4	5	1	3	1	2	1	1	3	0	0	4
16		7	2	6	3	5	3	3	4	0	0	1	3	1	2	1	2	2	1
17		9	1	1	3	3	4	1	2	4	2	0	3	2	1	1	2	1	1
18		1	2	4	1	1	2	2	4	2	0	2	7	2	1	0	5	0	1
19		4	4	6	3	0	3	2	5	3	3	1	2	3	3	4	2	3	4
20		3	4	7	2	1	1	2	1	3	3	2	1	4	3	1	3	0	1
21		2	8	5	4	4	3	4	7	3	3	1	1	3	7	2	2	2	3
22		2	6	4	8	7	5	2	1	1	2	3	7	3	3	1	2	0	1
23		1	4	6	3	3	5	3	3	2	2	1	3	2	4	2	4	4	2
n	10	14	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24	24
N*	31	45	94	112	93	76	67	69	78	64	60	48	59	57	57	44	66	63	54
N**	31	45	94	112	93	76	67	69	78	64	60	48	59	57	57	44	66	63	54
N(24)	74	93	94	112	93	76	67	69	78	64	60	48	59	57	57	44	66	63	54
N(24)*		86	124	116	100	78	66	82	100	82	68	56	68	68	84	72	96	64	

had passed before the observation was commenced. By that time, more than two-thirds of large aftershocks had occurred, as estimated from the routine observation by the JMA network.[2)]

Hourly frequencies of aftershocks observed at each station are given

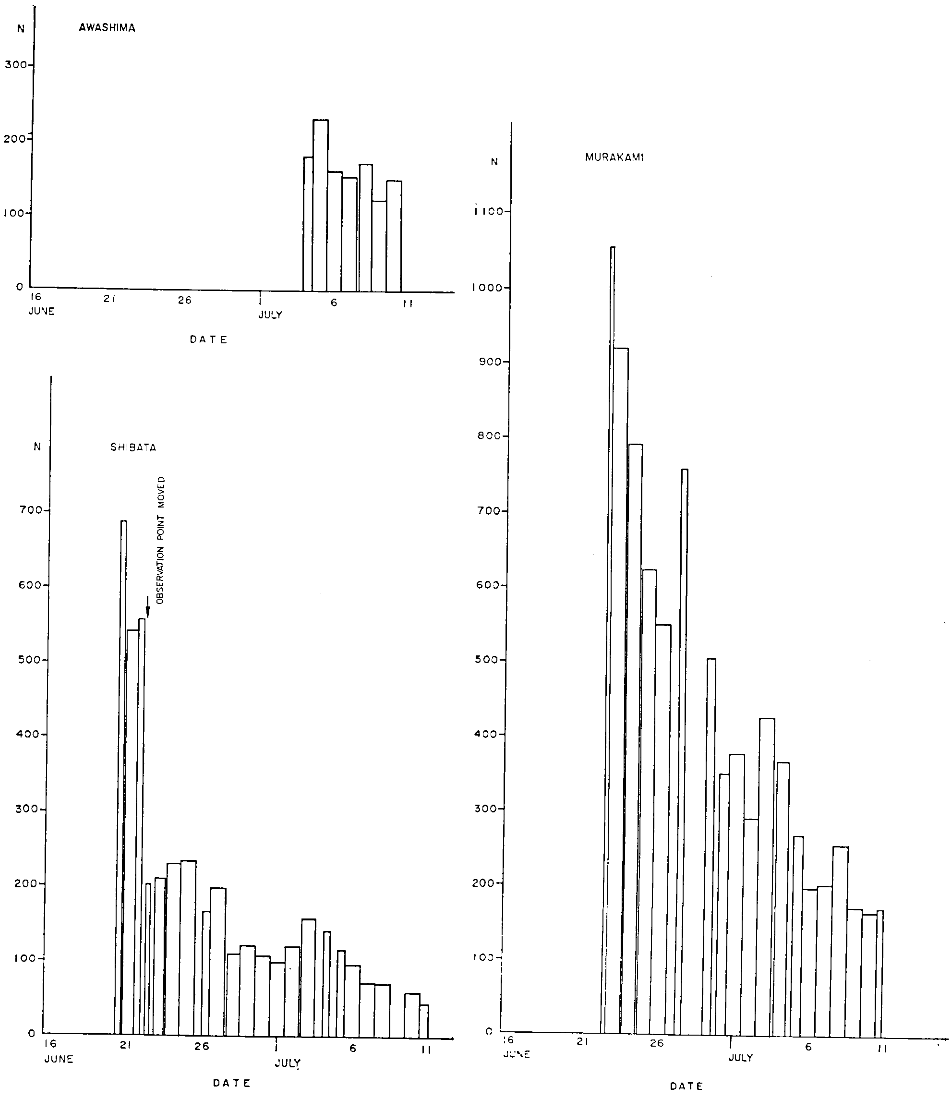

Fig. 3

2) "The Report on the Niigata Earthquake, 1964". Technical Report of the Japan Meteorological Agency. No. 43 (1965).

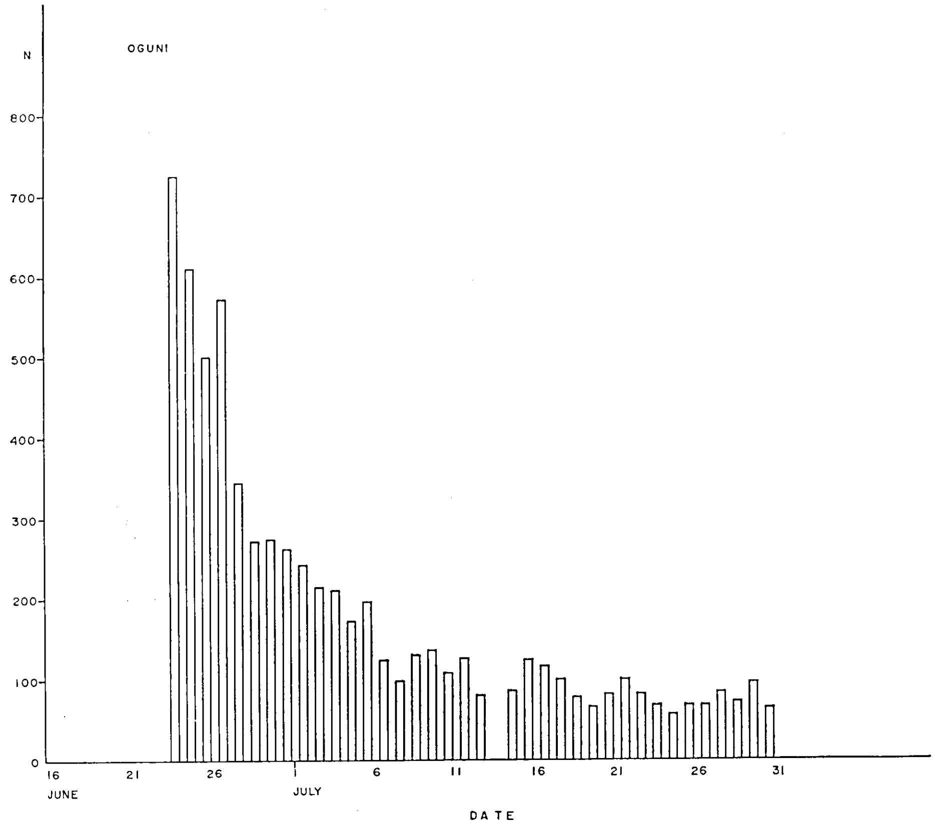

Fig. 3 (continued)
Fig. 3 Daily frequency of the aftershocks observed with HES1-0.2

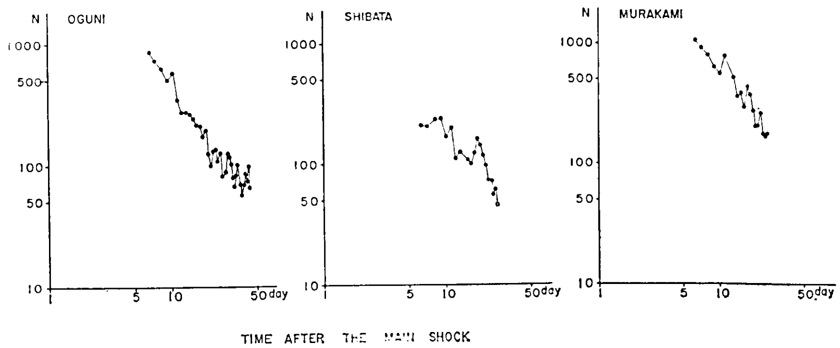

Fig. 4 Time frequency diagram for aftershock sequence

in Table 2 and daily frequencies are shown in Fig. 3. In Fig. 3, the height of column indicates the number of aftershocks *per day* and the width of column is proportional to the observation time on that day, so that the area of column is proportional to the number of aftershocks actually observed.

At the Oguni station, the number of shocks detected in the day time was far smaller than that in the night, due to the effect of the ground noise. Therefore the number of shocks observed in twelve hours from 20 h to 08 h on the next day are doubled and shown in Fig. 3(d) for the sake of comparison with daily frequencies at the other stations.

The Oguni station continued observation for 39 days until August 1, while the other stations stopped their operations before July 11. The

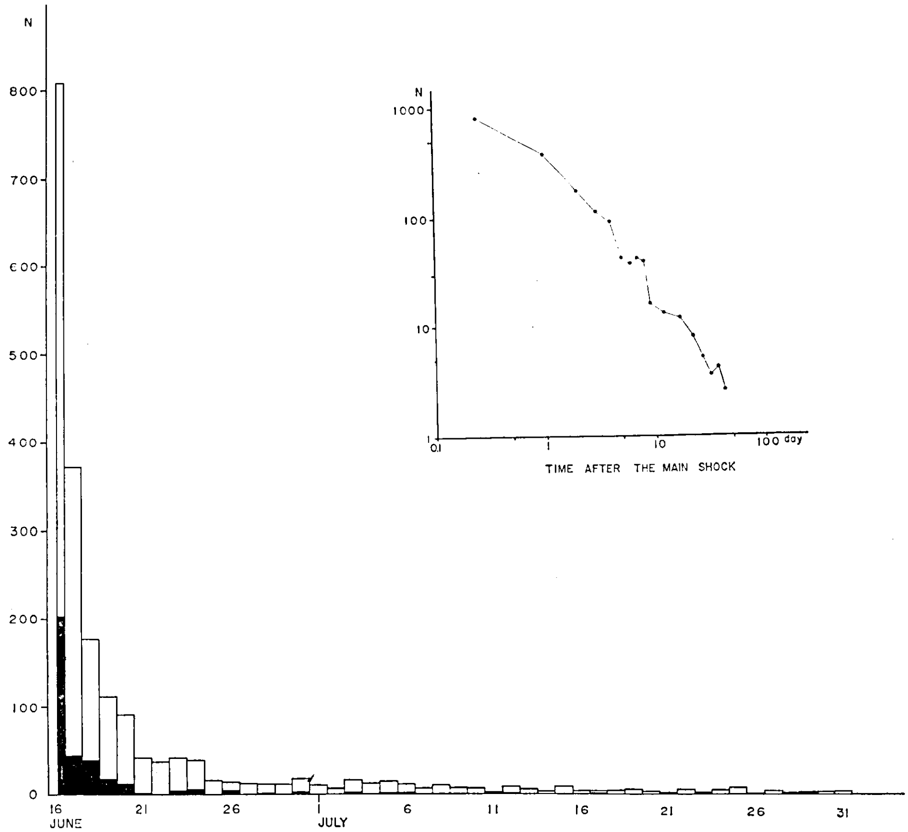

Fig. 5 Daily frequency of the aftershocks observed at two or more stations of JMA's network. Black parts indicate the number of felt shocks.

seismograph at the Oguni station, which lay at a suitable distance from the epicentral region, was kept in a good condition, so that the frequency of aftershocks observed at this station give a good measure of the general tendency of the aftershock activity.

If we assume that the decay of an aftershock activity is expressed by the equation $n(t)=Nt^{-h}$,[3] where $n(t)$ is the frequency of aftershocks at time t and N and h are constants. In the present case, h is determined to be 1.6. This value is rather large than usual ones.[4] In other words, the decaying rate of the aftershock activity in the present case is rapid.

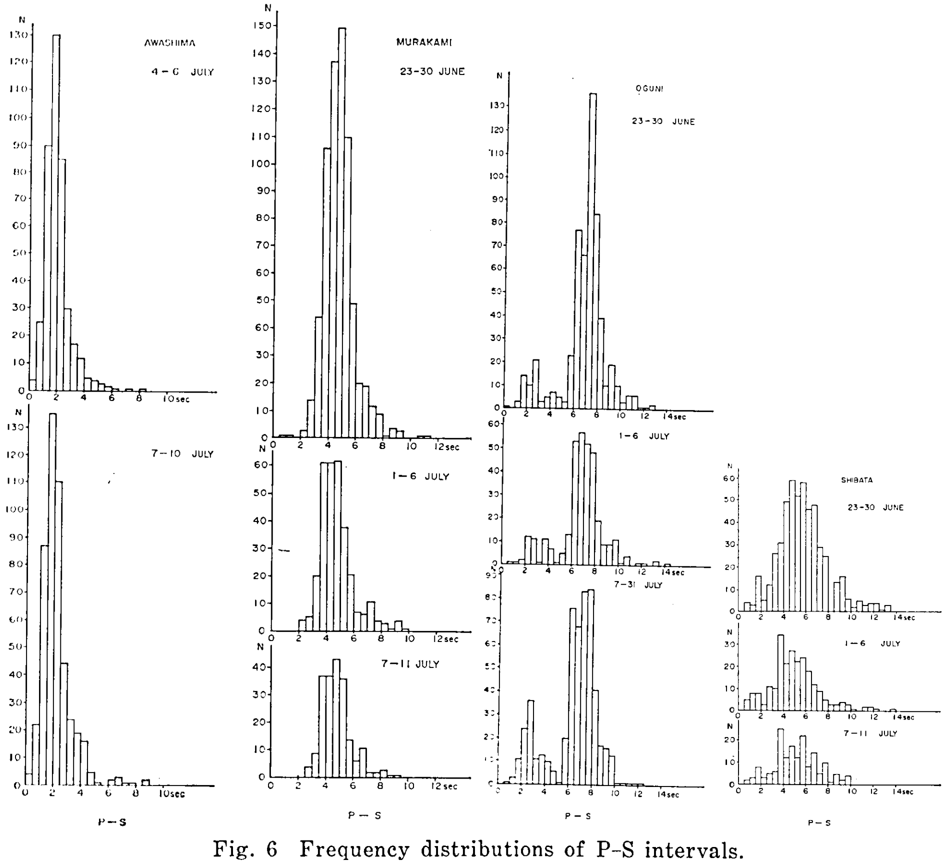

Fig. 6 Frequency distributions of P-S intervals.

3) K. MOGI, "On the Time Distribution of Aftershocks Accompanying the Recent Major Earthquakes in and near Japan," *Bull. Earthq. Res. Inst.*, **40** (1962), 107-124.

4) *ibid.*, 3)

After July 15, the decaying rate of the aftershock activity appears to slow down. This may be attributed to local micro-earthquake activity near the Oguni station, which seems to be rather stationary and to follow a different law from the main part of the aftershocks (refer to the next section).

The aftershock activity observed at Murakami and Shibata showed a large fluctuation. It is difficult to find its general tendency, but it appears to have a slower decaying rate than that observed at Oguni.

In order to investigate the decay of the aftershock activity in the earlier period, i.e., from June 16, the day of the main shock, to June 21, during which the temporary observation was not being carried out, daily frequencies of aftershocks observed at two or more stations of the JMA Network are given in Fig. 5.[5] From these data, the coefficient h is estimated to be 1.6 to 1.7, which is approximately equal to the value obtained from the temporary observation at Oguni.

3. Distribution of P–S intervals.

The distribution of P–S intervals at every station are given in Fig. 6. At Awashima, where is in the midst of the aftershock area, 81 percent of the aftershocks observed has P–S intervals between 1.0 sec and 3.0 sec, and the shocks with P–S intervals shorter than 1.0 sec were very few. This fact tells us that few aftershocks occurred at depth shallower than 10 km.

At Shibata, 78 percent of the aftershocks observed had P–S intervals between 3.0 sec and 8.0 sec, and at Murakami 86 percent had P–S intervals between 3.0 sec and 6.5 sec. At Oguni, 81 percent of the shocks had P–S intervals between 5.5 sec and 10.0 sec, but the distribution of P–S intervals at this station had another group around 3.0 sec and there was a clear blank around 5.0 sec.

Whether the shocks having P–S intervals around 3.0 sec at Oguni are aftershocks of the Niigata Earthquake or not is indistinct now, because no other micro-earthquake observation had been carried out in this region before that time and accordingly the normal level of micro-earthquake activity is unknown. However it is found that the shocks with P–S intervals around 3.0 sec did not show the same decay rate as the aftershocks with P–S intervals 5.5 sec – 10.0 sec, but it was rather stationary with respect to time, when the frequency distributions of P–S intervals

5) *ibid.*, 2)

in the three periods in Fig. 6 were compared.

Whether the activity of shocks having P–S intervals around 3.0 sec at Oguni was a usual seismic activity in this region or a seismic sequence activated by the Niigata Earthquake will require further investigation. If a micro-earthquake observation is carried out in the same place after a few years, some information will be obtained about this nature.

At every station, no significant change was observed in the P–S interval distribution with respect to time.

4. Magnitude.

Magnitudes, origin times, epicenters and focal depths of 208 aftershocks have been determined by JMA.[6] Cumulative frequency distribution (open circles in Fig. 7) of the aftershocks with magnitude larger than a fixed value shows that the aftershocks with magnitude larger than 4.0 were almost entirely detected and located by the JMA network.

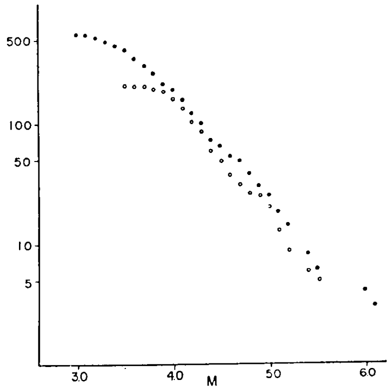

Fig. 7 Cumulative frequency distribution of the aftershocks against magnitude.
○ the shocks, of which the magnitudes were determined by JMA,
● including the shocks, of which the magnitudes were determined by ERI.

The magnitude of 550 aftershocks was determined from the Anderson-Wood seismograms and the HES 1-1 seismograms at Tsukuba Seismological Station of the Earthquake Research Institute, about 250 km far from the epicentral region. Among these aftershocks, 340 shocks were so small in magnitude that the JMA network observation were not able to determine their magnitudes. Some discrepancy exists between the magnitudes determined by JMA and those determined from data at Tsukuba, so that the Tsukuba magnitudes were adjusted so as to be consistent with the JMA magnitudes on an average.

The cumulative frequency distribution of magnitude determined in the foregoing procedure (close circles in Fig. 7) shows that the magnitudes were determined for all shocks with magnitudes larger than 3.6. According to this figure, the coefficient b in the Gutenberg-Richter's

6) *ibid.*, 2)

relation $\log N = a - b(8-M)$,[7] where N is the number of shocks with magnitude M and a is a constant, is 1.0, which is a usual value.

The cumulative sum of the energy released by the aftershocks calculated from the equation $\log E = 11.8 + 1.5\,M$[8] is shown in Fig. 8. More than two-thirds of the energy that was released in 45 days following the main shock was released within only twelve hours just after the main shock.

Determination of origin times, epicenters and focal depths will be reported in the next paper.[9]

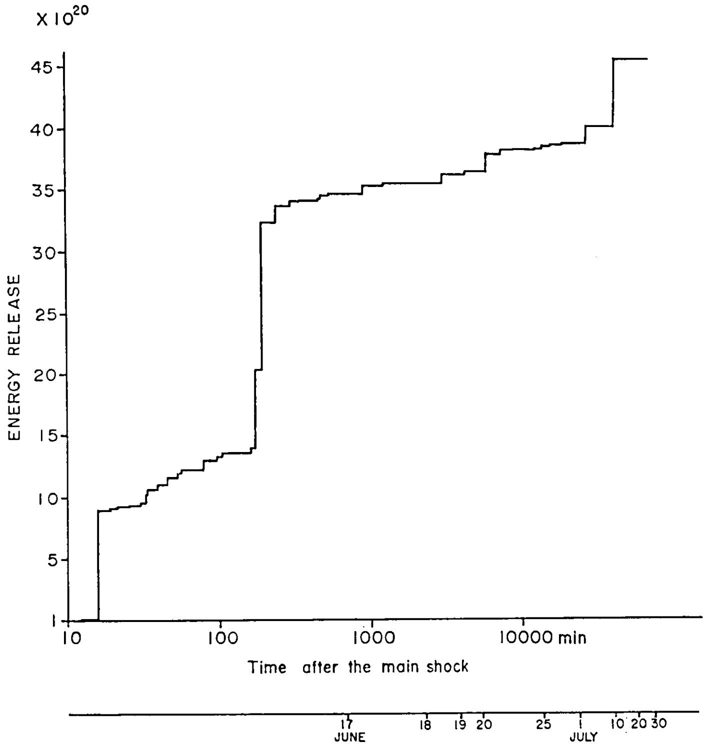

Fig. 8. Cumulative energy released by the aftershock sequence.

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7) B. GUTENBERG and C. F. RICHTER, Seismicity of the Earth and Related Phenomena, (Princeton Univ. Press, 1954).

8) B. GUTENBERG and C. F. RICHTER, "Magnitude and Energy of Earthquakes", Ann. di Geofisica, **9** (1956), 1-15.

9) I. KAYANO, "Determination of Origin times, Epicenters and Focal Depths of Aftershocks of the Niigata Earthquake of June 16, 1964", *Bull. Earthq. Res. Inst.*, **46** (1968), 223-269.

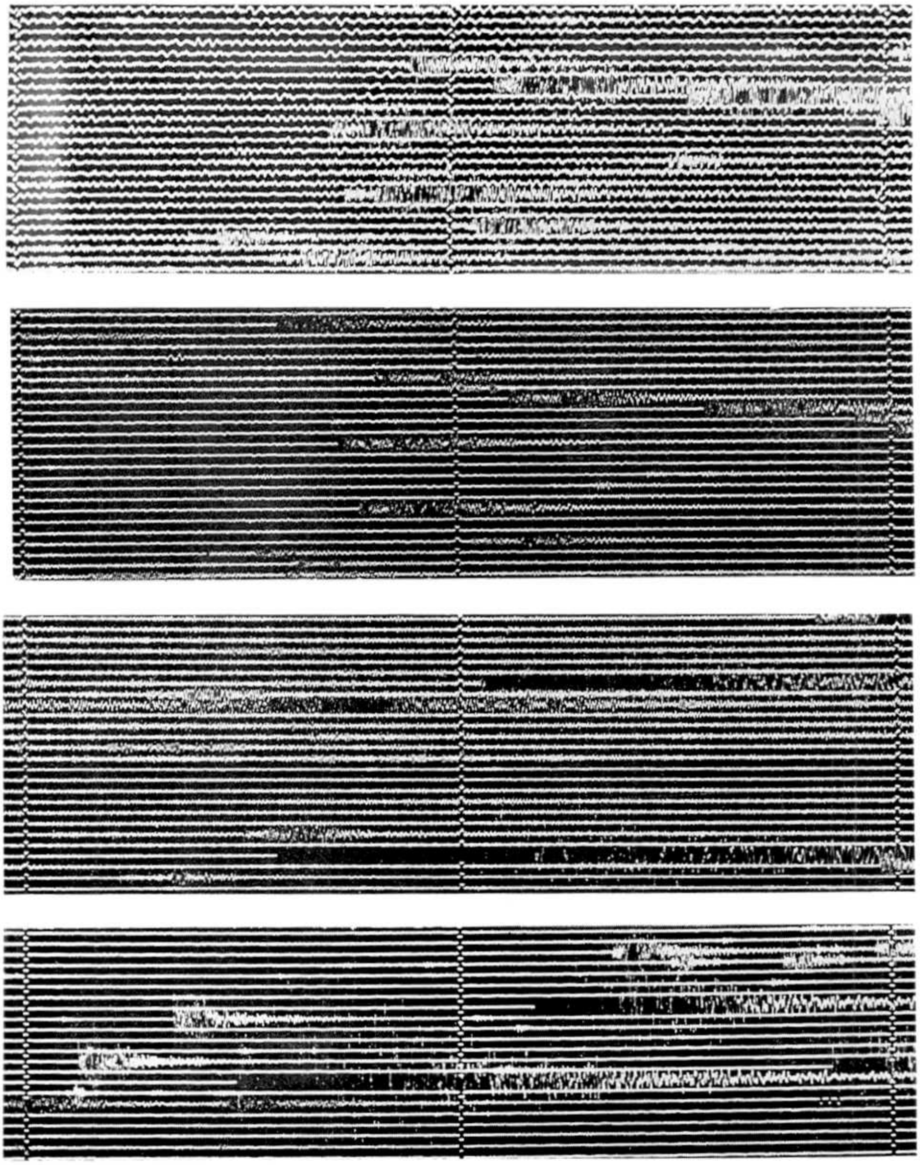

Fig. 9.

Examples of "HES 1-0.2" seismograms. (original film ×2.8)

Up to down,

Murakami	June 26-27, 1964
Oguni	June 26-27, 1964
Oguni	July 4-5, 1964
Awashima	July 4-5, 1964

The authors extend their gratitude to the members of the Shibata Municipal Government, the Murakami Municipal Government, the Awashima-ura Village Office, the Oguni Town Office and the Awashima Kanko Hotel, all of who kindly offered their services for the observation.

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11. 昭和39年6月16日新潟地震余震観測

地震研究所余震観測班

昭和39年6月16日13時1分頃，新潟県北部西方沖（粟島南方）に，マグニチュード7.5の地震が発生し，新潟市付近から山形県南部にかけて被害を生じた．

地震研究所から余震観測班が送られ，新潟県新発田，村上，山形県小国及び，震央に近い粟島で観測が行われた．加速度計と HES 1-0.2 電磁式地震計が用いられ，極めて多数の余震が観測された．小国では，6月23日から8月1日まで，39日間観測が行われ，この結果から，余震回数が $n(t)=Nt^{-h}$ に従つて減少するものとすると，h は 1.6 となり，余震回数の減少が急激であつたことがわかる．

余震域のほぼ中央にある粟島で，P-S 時間 1.0 秒以内の余震が少なかつたことは，余震が比較的深いところで起つていたことを示している．

震央域から 250 km 離れた筑波地震観測所の Anderson-Wood 地震計及び HES 1-1 地震計の記象から，550 個の余震のマグニチュードが決定された．マグニチュード 3.6 以上の余震は，全てマグニチュードが決定された．余震のエネルギーの 2/3 以上が，本震後 12 時間以内に放出された．