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Contents

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Introduction.

The present publication contains the results of the seismometrical observations made at the Central Meteorological Observatory, Tokyo, in the year 1928.

Position of the Observatory :—

Longitude :	139° 45′ E
Latitude :	35° 41′ N
Height from mean sea level :	21 m.
Geological nature of the ground :	Diluvium.

Instruments :— The instruments in use at the observatory are :—

Wiechert's 200 kg. horizontal seismograph.

			EW comp.	NS comp.
Constants	Magnification	V_0	88	74
	Damping coeff.	v	4.3	3.2
	Coeff. of friction	ε	0.02	0.02
	Proper peried	T_0	4.1 s	4.6 s

Wiechert's 80 kg. vertical seismograph.

Constants	Magnification	V_0	44
	Damping coeff.	v	4.7
	Coeff. of friction	ε	0.03
	Proper period	T_0	4.2 s

Fürst Galitzin's horizontal seismograph with photographic registration.

			EW comp.	NS comp.
Constants	Max. magnification	V_0	1000	1000
	Damping coeff.	v	7.0	7.0
	Proper period	T_0	17.4 s	17.4 s
	Proper period of galvanometer	T_g	15.1 s	12.3 s

Fürst Galitzin's vertical seismograph with photographic registration.

Constants	Max. Magnification	V_0	500
	Damping coeff.	v	7.0
	Proper period	T_0	10.0 s
	Proper period of galvanometer	T_g	12.0 s

Mainka's 450 kg. horizontal seismograph.

			EW comp.		NS comp.	
			I	II	I	II
Constants	Magnification	V_0	92	120	112	110
	Damping coeff.	v	4.5	4.1	6.3	5.2
	Coeff. of friction	ε	0.01	0.03	0.02	0.02
	Proper period	T_0	9.4 s	12.0 s	12.1 s	12.0 s

Omori's horizontal seismograph (improved at our observatory) with magnetic damper.

			EW comp.	NS comp.
Constants	Magnification	V_0	20	20
	Damping coeff.	v	2.2	2.1
	Coeff. of friction	ε	0.05	0.05
	Proper period	T_0	15 s	15 s

Omori's Portable seismometer.

			EW comp.	NS comp.
Constants	Magnification	V_0	50	50
	Coeff. of friction	ε	0.04	0.04
	Proper period	T_0	3.0 s	3.0 s

C. M. O. seismograph of low magnifiation.

			EW comp.	NS comp.	V comp.
Constants	Magnification	V_0	2	2	2
	Damping coeff.	v	2.5	2.5	2.5
	Coeff. of friction	ε	0.05	0.05	0.03
	Proper period	T_0	3.5 s	3.5 s	2.5 s

For the recording of teleseismic disturbances and distant earthquakes, we use the seismographs of Galitzin, Mainka and Omori, and for the observation of near earthquakes, Wiechert's seismograph and Omori's seismometer are used.

Scales of the intensity of earthquake :— The intensity of earthquake has been estimated according to the scale 0 to 6 and the comparison of our scale with Cancani's scale is as follows ;—

Cancani's scale	I II	III IV	V VI	VII VIII	IX	X	XI XII
	0	1	2	3	4	5	6
Name	No feeling	Slight	Moderate	Rather strong	Strong	Very strong	Disastrous
Acceleration mm/sec²	<2.5 | 2.5–5.0	5–10	10–25	25–50	50–100	100–250	250–500	500–1000	1000–2500	2500–5000 | >5000

Methods of determining the epicenter :— The following four methods are used to dertermine the epicenter of any earthquake from the observations taken at the stations in this country ;—

1. By the direction of initial motion.

2. By the epicentral distance determined from Prof. Omori's formula $\Delta=7.42t$ for the near earthquakes, in which Δ is the epicentral distance and t the duration of the preliminary tremor PS.

3. By the isochronous lines, which are drawn with the data taken from the reports of the meteorological stations.

At these stations the time are kept by marine chronometers, the daily rate of which being determined by catching the wireless time signals.

4. By iso-PS lines according to S. I. Kunitomi's method.

These lines are drawn so as to fit places having the preliminary tremor of equal duration.

The positions of epicenters of the earthquakes thus determined are given in the annexed table with their longitude and latitude and also found in the chart on which are marked the positions of epicenters of remarkable and moderate earthquakes occurred in the year 1928.

Method of the keeping time :— Time of occurrence of an earthquake and other time elements in our seismometrical reports are deduced from seismograms with three standard clocks and chronometers which are connected to the time-tick system of each seismograph.

These are as follows :—

1. Clemens Riefler's Astronomical clock No. 482, München.
2. Dent standard Clock No. 3072, London.
3. Chronometer No. 128. Favre-Brandt, Nardin.

Chronometers used in time-tick { Marine chronometer No. 460 Werke G.M.B.H. Hamburg. / Chronometer No. 835 W. Brocking Hamburg. .

In the present report, times are all referred to the Greenwich mean time.

Symbols and Notations :— Symbols and notations used in this report are as follows :—

1. Phases.

P (undæ primæ)=First preliminary tremor.

$\overline{P}$=Individual or upper first preliminary tremor.

PR_n=Longitudinal waves n-times reflected at the earth's surface.

S (undæ secundæ)=Second preliminary tremor.

$\overline{S}$=Individual or upper second preliminary tremor.

SR_n=Transverse waves n-times reflected at the earth's surface.

PS=Waves changed from longitudinal to transverse oscillation, or vice versa, through reflection at the earth's surface.

L (undæ longæ)=Long waves at the beginning of the surface phase.

Q (undæ quartæ)=Shorter and more regular waves in the surface phase.

M (undæ maximæ)=Greatest motion in the surface phase, usually in the group here defined as Q.

C (Coda)=Tail or end portion.

F (Finis)=End of discernible movements.

2. Nature of the motion.

i (impetus)=Sudden beginning of the motion.

e (emersio)=Gradual beginning of the motion.

T (Period)=Time of one complete oscillation.

A=Amplitude of the earth motion in microns.

A_E=E—W component of A.

A_N=N—S component of A.

A_Z=Vertical component of A.

3. Character of the earthquake.

d (terræ motus domesticus)=Local shock.

v (terræ motus vicinus)=Near shock.

r (terræ motus remotus)=Distant shock (Origin from 1000 km. to 5000 km. distant).

u (terræ motus ultimus)=Very distant shock or teleseism (Origin more than 5000 km. distant).

Data of the earthquakes :—

In the case of remarkable earthquakes, a full data reported from the meteorological stations of this country are given in the present report. The position of these stations are found in the annexed plate.

The present report has been prepared by Mr. S. I. Kunitomi in charge of the Seismological Division and Mr. K. Hayata of the same Division.

General Survey of the Seismic Activity of Japan in the Year 1928.

In this year 4531 earthquakes were recorded by the seismographs at the meteorological observatories in this country. At the Central Meteorological Observatory, Tokyo, however, 441 earthquakes were recorded throughout the whole year. The following table shows the number of the earthquakes recorded at Tokyo, classified by the intensity.

		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum.
Number of unfelt earthquake		15	20	25	18	59	52	21	23	50	21	29	42	375
Number of felt earthquake		9	5	6	6	13	2	4	6	3	9	1	2	66
Intensity of felt earthquake	Slight I	8	4	4	4	8	2	3	3	3	8	1	2	50
	Moderate II	0	0	0	2	4	0	1	3	0	0	0	0	10
	Rather strong III	0	1	2	0	0	0	0	0	0	1	0	0	4
	Strong IV	1	0	0	0	0	0	0	0	0	0	0	0	1
	Very strong V	0	0	0	0	1	0	0	0	0	0	0	0	1

The total number of earthquakes recorded at the observatories in this year was less than that of the last year i. e., 1927 by 1496 and also less than that of the year 1926 by 382. It is clear that such a great decrease of the number of earthquakes was due to the absence of destructive shock in this year. In 1927 the great earthquake occurred at North Tango district in Kyoto Prefecture which was accompanied by more than one thousand after shocks. Those after tremors increased remarkably the total number of earthquakes. Beside this, in the last year five other semidestructive shocks broke out here and there in the territory of our country.

In this year, however, no destructive earthquake was experienced anywhere in the country except that occurred at the northern coast of the Bay of Tokyo on 21st May which inflicted a slight damages on the epicentral region.

The following table shows the comparison of the total number of felt and unfelt earthquakes occurred in this year to that of the last year.

	1927	1928	Difference
Number of unfelt earthquakes	3958	3081	(−) 877
Number of felt earthquakes	2069	1450	(−) 619
Total number of earthquakes	6027	4531	(−) 1496

The localities where the seismic activity was prosperous in this year were the outer earthquake zone which runs along the Pacific coast from Tisima Islands (Kurile Islands) in the North to Kasimanada in the South, valleys of river Kinu and Kokai in Kwanto district, Kii-strait, Valleys of river Kikuti and Midori in Kumamoto province. The daily mean number of shocks occurred in this year through the whole country was 12.7 and shows the decrease of about 20% from that of the last year.

The monthly number of earthquakes occurred in this year was classified according to the magnitude of felt area and tabulated as follows. In this table, remarkable, moderate, small felt area and local earthquakes are distinguished by the length of the major radius of felt area.

Namely

Remarkable earthquake	Radius exceeds more than 300 km.
Moderate ,,	Radius, between 300 km. and 200 km.
Earthquake of small felt area	Radius, between 200 km. and 100 km.
Local earthquake	Radius is less than 100 km.

Number of	Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum
Remarkable earthuuake	0	2	1	0	2	1	0	0	1	0	0	0	7
Moderate earthquake	1	1	1	1	3	2	2	4	2	1	1	3	22
Earthquake of small felt area	16	3	9	3	16	17	5	11	7	13	8	6	114
Local earthquake	143	151	111	109	130	87	77	97	74	97	109	122	1307
Total number of felt earthquake	160	157	122	113	151	107	84	112	84	111	118	131	1450
Total number of unfelt earhquake	297	259	249	227	353	359	229	248	244	174	191	251	3081
Total sum	457	416	371	340	504	466	313	360	328	285	309	382	4531

The following table shows the classification of the total felt earthquakes occur-

red in our country and its neighbourhood according to the positions of their epicentres.

District		Jan.	Feb.	Mar.	Apr.	May	June	July	Aug.	Sept.	Oct.	Nov.	Dec.	Sum
Neighbourhood of Hokkaido	Tisima Is.	0	0	0	0	13	0	2	1	0	0	0	0	6
	Pacific	7	2	10	5	5	14	10	8	7	6	11	8	93
	Inland	0	4	1	2	3	0	0	1	0	2	1	0	14
	Japan sea	0	0	0	0	0	0	0	0	0	1	0	0	1
Northeastern part of Honsyu	Pacific	3	5	2	4	19	17	3	8	3	9	4	3	80
	Inland	5	3	2	3	3	2	2	2	0	2	0	3	27
	Japan sea	0	0	0	0	0	0	0	0	0	0	0	0	0
Kwanto District	Pacific	13	11	5	6	15	5	3	10	14	6	4	23	115
	Inland	17	19	18	20	26	10	8	7	9	14	9	11	168
	Bay of Sagami	1	8	2	0	3	0	3	0	1	2	1	2	23
Middle part of Honsyu	Japan sea side	1	4	0	0	2	0	0	0	1	1	0	0	9
	Inland	6	15	6	2	5	1	6	3	7	2	14	1	68
	Pacific	1	2	0	6	1	3	0	2	0	0	0	0	15
Kinki District	Kii strait	53	38	43	32	37	28	29	36	20	27	28	41	412
	North Tango district	4	7	2	4	0	1	1	0	1	3	1	3	27
	Inland	4	1	3	4	3	3	2	1	2	1	5	1	30
Neighbourhood of Tyugoku and Sikoku	Japan sea side	6	2	3	2	4	0	0	0	1	2	1	1	22
	North Tazima	0	0	2	0	1	6	2	1	0	0	0	0	12
	Sanyo district	1	10	2	4	5	1	2	1	5	9	4	1	45
	Seto Inland sea	0	0	0	0	0	1	0	0	2	1	0	0	4
	Sikoku	3	5	2	3	0	1	1	1	1	2	2	5	26
	Pacific	0	0	0	0	0	0	0	0	0	0	1	0	1
Kyusyu	Northern Part	1	4	8	2	3	2	3	14	6	8	24	18	93
	Southern Part	6	5	0	7	4	8	3	0	0	5	2	3	43
Okinawa Islands		6	6	8	2	6	1	0	1	0	4	5	4	43
Taiwan (Formosa)		20	6	3	5	3	2	3	14	3	3	1	2	65
Tyosen (Corea)		2	0	0	0	0	1	0	0	1	0	0	1	5
Karahuto (Saghalien)		0	0	0	0	0	0	0	1	0	1	0	0	2
The others		0	0	0	0	0	0	1	0	0	0	0	0	1
Total number		160	157	122	113	151	107	84	112	84	111	118	131	1450

TABLE. I.

Table of the Shocks observed at the Central Meteorological Observatory, Tokyo in the year 1928.

January

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
1	1	P	7	17	16.2					S 84	43	Felt strongly,
		S		〃	22.4					W 97		Lower valley of the River
		M_N		〃	23.5	+2150			1.3	U 200		Kinu, Ibaraki Prefecture,
		M_E		〃	23.5		−2050		1.3			140°.0 E, 36°.0 N.
		C		22	10							Felt area 71000 sq. km.
		F		32	—							*v.*
2	3	P	7	31	39.0						29	Felt slightly,
		S		〃	46.0							The Bay of Tokyo.
		M_N		〃	〃	+375						*d.*
		M_E		〃	〃		+260					
		C		32	40							
		F		34	—							
3	4	P	10	38	45.1						17	Felt slightly,
		S		〃	50.5							Off the coast of Honmoku,
		M_N		〃	〃	−34						The Bay of Tokyo.
		M_E		〃	〃			+23				*d.*
		F		39	10							
4	4	P	10	51	04.1						29	Felt slightly,
		S		〃	09.7							Off the coast of Honmoku,
		M_N		〃	〃	−42						Thh Bay of Tokyo.
		M_E		〃	〃			−25				*d.*
		F		〃	30							
5	7	P	8	31	08.3						20	Felt slightly,
		S		〃	13.7							Off the coast of Haneda,
		M_N		〃	〃	−40						The Bay of Tokyo.
		M_E		〃	〃			+40				*d.*
		C		〃	29							
		F		32	—							
6	8	P	10	07	01.8						95	Felt slightly,
		S		〃	14.7							Southern off to the coast
		M_N		〃	18.0	−150			1.2			of Tyosi, Tiba Prefecture.
		M_E		〃	32.0		−120		1.5			*v.*
		F		13	—							
7	14	P	18	17	52.7						130	Felt slightly,

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion μ	Δ Km	Intensity, Epicentre and Remarks.
		S	18	18	10.8							Off the coast of Kasima-
		MN	〃	〃	13	+25						nada, Ibaraki Prefecture.
		ME	〃	〃	〃		+20					*d.*
		F	〃	23	—							
8	16	P	4	08	21.8					W 8.7	36	Felt slightly,
		S	〃	〃	29.2					S 5.0		Lower valley of the River
		MN	〃	〃	29.6	−240				U 10.0		Kinu, Ibaraki Prefecture.
		ME	〃	〃	29.5		±330					*d.*
		C	〃	11	20							
		F	〃	13	—							
9	18	P	13	11	34.1						350	Felt slightly,
		S	〃	12	28.1							Southern off to the
		MN	〃	〃	30.0	+25						Hatijyo Island, Tokyo
		ME	〃	〃	〃		+15					Prefecture.
		F	〃	15	30							*v.*

February

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion μ	Δ Km	Intensity, Epicentre and Remarks.
10	2	iP	22	34	43.9						47	Felt slightly,
		iS	〃	〃	53.4							Lower valley of the River
		MN	〃	〃	58.1	−107			1.0			Kinu, Ibaraki Prefecture.
		ME	〃	〃	53.4		+149		1.0			*d.*
		MZ	〃	35	00.5			+30	0.8			
		F	〃	43	—							
11	3	e	13	54	33.1							Distant earthquake,
		F	14	34	—							Aleutian Islands.
												r.
12	3	eP	18	49	47.0						250	Felt sliyghtl,
		iS	〃	50	12.1							Southern off to the cape
		MN	〃	〃	34.8	+201			3.3			of Kinkwazan, Miyagi
		ME	〃	52	31.2		+191		4.4			Prefecture, 141°. 3 E, 37°
		MZ	〃	〃	57.6			+70	3.2			.6 N.
		F	19	08	—							Felt area 94500 sq. km.
												v.
13	4	eP	2	34	25.5						20	Felt slightly,
		iS	〃	〃	33.8							Lower valley of the River
		MN	〃	〃	34.5	+103						Edo, Tiba Prefecture.
		ME	〃	〃	〃		−67					*d.*

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion	Δ μ	Km	Intensity, Epicentre and Remarks.
		F	2	38	—								
14	6	e	3	59	02								Distant earthquake.
		F	5	09	—								*r.*
15	8	eP	4	06	05.3							48	Felt slightly,
		eS	〃	〃	14.3								Neighbourhood of the
		MN	〃	〃	15.5	+61				0.5			Kugeto marsh, the valley
		ME	〃	〃	〃		+66			0.5			of the River Tone.
		F	〃	09	—								*d.*
16	11	iP	21	10	28.4						S 118.4	45	Felt rather strongly,
		iS	〃	〃	37.1						E 57.0		Lower valley of the River
		MN	〃	〃	38.3	−1650				2.5	U 434.0		Kokai, Ibaraki Prefec-
		ME	〃	〃	〃		−2600			2.5			ture. 140°.0 E, 36°.1 N.
		MZ	〃	12	07.4			−614		1.4			Felt area 195000 sq. km.
		F	〃	26	—								*v.*
17	13	e	5	38	36.7								Distant earthquake,
		iS	〃	〃	30.1								*r.*
		F	〃	07	—								
18	20	e	3	04	09.3							580	Upper valley of the River
		eS	〃	05	17.8								Takahasi, Okayama
		ME	〃	05	33.3		+25			2.8			Prefecture,
		F	〃	10	—								133°.4 E, 34°.9 N.
													Felt area 132000 sq. km.
													v.
19	21	e	19	57	19.3								Distant earthquake.
		eL	20	09	03.5								*r.*
		F	〃	53	—								

March

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion	Δ μ	Km	Intensity, Epicentre and Remarks.
20	1	iP	21	28	11.2						S 7.9	60	Felt slightly,
		iS	〃	〃	20.4						W 3.9		Neighbourhood of
		MN	〃	〃	23.6	−161				0.6	U-10.9		Mt. Tukuba, Ibaraki
		ME	〃	〃	〃		+118			0.6			Prefecture.
		F	〃	33	—								*d.*
21	7	e	22	55	57								Distant earthquake.
		F	23	35	—								*r.*
22	9	eP	17	43	33.8						D 7.6	82	Felt slightly,
		iS	〃	〃	44.3								Off the coast of Kuzyu-
		MN	〃	〃	48.1	−119				1.8			kuri, Tiba Prefecture.

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion	Δ μ	Km	Intensity, Epicentre and Remarks.
		ME	17	44	02.2		+110		1.2				v.
		MZ	〃	43	44.3			+30	0.9				
		F	〃	51	—								
23	23	iP	1	21	38.5					W 7.4	65		Felt rather strongly,
		iS	〃	〃	46.0					N 3.6			Upper valley of the River
		MN	〃	〃	〃	−1400			1.5	D 222.7			Nakakawa, Saitama Pre-
		ME	〃	〃	〃		−2400		1.5				fecture, 139°.8 E, 36°.0 N.
		MZ	〃	〃	〃			+400	—				Felt area 552000 sq. km.
		F	〃	31	—								v.
24	27	eP	15	05	24.3						50		Felt slightly,
		iS	〃	〃	32.6								Lower valley of the River
		MN	〃	〃	32.9	−34			0.6				Kinu, Ibaraki Prefecture.
		ME	〃	〃	36.0		+69		0.6				d.
		F	〃	08	—								
25	29	iP	5	07	18.3					D 15.2	400		Felt rather strongly,
		iS	〃	08	18.1								Western off to the Hatizyo
		MN	〃	〃	23.2	−1750			3.0				Island.
		ME	〃	〃	21.9		+1500		3.0				v.
		MZ	〃	09	38.7			−341	4.5				
		F	6	00	—								
26	29	iP	6	57	34.8					D 6.0	50		Felt slightly,
		iS	〃	〃	42.9								Lower valley of the River
		MN	〃	〃	44	+106			0.7				Kokai, Ibaraki Prefecture.
		ME	〃	〃	〃		+190		0.7				d.
		MZ	〃	〃	45			−39	0.7				
		F	7	02	—								

April

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion	Δ μ	Km	Intensity, Epicentre and Remarks.
27	6	P	10	33	24.2						70		Felt slightly,
		S	〃	〃	34.1								Middle valley of the
		MN	〃	〃	50.0	−90			0.2				River Kinu, Ibaraki
		ME	〃	〃	49.6		±80		0.2				Prefecture.
		MZ	〃	〃	〃			±20	0.2				d.
		F	〃	37	—								
28	6	P	14	06	54.9					NW	150		Felt slightly,
		S	〃	07	14.5								South-eastern off to the
		MN	〃	〃	15.1	±60			0.2				coast of Mera, Tiba

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
		ME	14	07	15.7		±80					Prefecture.
		F	〃	11	—							*v.*
29	8	P	8	57	59.5						54	Felt slightly,
		S	〃	58	08.5							Lower valley of the River
		MN	〃	〃	12.7	−100				0.3		Kokai, Ibaraki Prefec-
		ME	〃	〃	12.1		+100					ture.
		MZ	〃	〃	〃			±20				*d.*
		F	9	04	—							
30	10	P	20	51	52.6						28	Felt slightly,
		S	〃	〃	58.7							Off the coast of Hon-
		MN	〃	〃	〃	−90						moku, the Bay of Tokyo.
		ME	〃	〃	〃		±10					*d.*
		F	〃	53	—							
31	12	P	16	36	31.7						60	Felt moderately,
		S	〃	〃	39.6							Middle valley of the River
		MN	〃	〃	47.0	+720						Kokai, Ibaraki Prefec-
		ME	〃	〃	40.8		+530					ture. 140°.1 E, 36°.2 N.
		F	〃	45	3.0							Felt area 95300 sq. km.
												v.
32	18	P	19	35	26							Distant earthquake.
		S	〃	45	33							*r.*
		L	20	06	46							
		F	21	00	—							
33	19	P	20	47	04.7						53	Felt moderately,
		S	〃	〃	13.3							Lake Kasumiga-ura,
		MN	〃	〃	〃	±300						Ibaraki Prefecture.
		ME	〃	〃	〃		±300					*v.*
		MZ	〃	〃	〃			±25				
		F	21	04	—							

May

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
34	1	P	11	42	01.0							Distant earthquake.
		S	〃	45	10.2							*r.*
		F	〃	49	—							
35	14	P	22	34	17.5							Distant earthquake.
		eL	23	17	—							*u.*
		P	24	13	—							

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ μ	Km	Intensity, Epicentre and Remarks.
36	17	P	16	56	17.1							118	Felt slightly,
		S	〃	〃	35.1								Off the coast of Mera,
		M_N	〃	〃	36.7	+75							Tiba Prefecture.
		M_E	〃	〃	36.7		+79						*v.*
		F	17	03	—								
37	19	P	10	32	33.8							NE	166 Felt moderately,
		S	〃	32	52.3							Down	Kasimanada, Ibaraki Pre-
		M_N	〃	33	34.0	−700					2.5		fecture, 140°.3 E, 36°.6 N.
		M_E	〃	33	34.0		+650				2.5		Felt area 257000 sq. km.
		F	〃	57	—								*v.*
38	20	P	16	29	23.1							E86	28 Felt very strongly,
		S	〃	〃	31.8							S58	The Bay of Tokyo,
		M_N	〃	〃	31.8	−5600					2.0	D900	141°.1 E, 35°.6 N.
		M_E	〃	〃	31.9		+11000				3.0		Felt area 352000 sq. km.
		C	〃	32	30								*v.*
		F	〃	52	—								
39	20	P	18	32	11.2							SE	29 Felt slightly,
		S	〃	〃	20.1							Down	After shock of the
		M_N	〃	〃	20.1	+300				—			former earthquke, No.38.
		M_E	〃	〃	20.1		+450			1.2			*d.*
		F	〃	39	—								
40	20	P	19	23	50.6							ESE	32 Felt slightly,
		S	〃	〃	59.4							Down	After shock of No.38.
		M_N	〃	〃	59.5	±450				—			*d.*
		M_E	〃	〃	59.5		±450			—			
		M_Z	〃	24	02.0			−130		—			
		F	〃	32	—								
41	21	P	17	45	51.1								24 Felt slightly,
		S	〃	〃	57.2								After shock of No.38.
		M_N	〃	〃	57.2	+173							*d.*
		M_E	〃	〃	57.2		+111						
		F	〃	47	30								
42	21	P	19	10	21.7								24 Felt slightly,
		S	〃	10	27.7								After shock of No.38.
		F	〃	12	—								*d.*
43	22	P	20	24	20.7								174 Felt slightly,
		S	〃	〃	38.0								Off the coast of Kasima-
		M_N	〃	〃	38.0	+35							nada, Ibaraki Prefecture,
		M_E	〃	〃	38.0		−37						*v*,
		F	〃	29	—								

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
44	22	P	20	41	27.0						25	Felt slightly, After shock of No.38. *d.*
		S	〃	〃	36.0							
		MN	〃	〃	36.0	−100						
		ME	〃	〃	36.0		+130					
		F	〃	43	30.0							
45	24	P	11	32	24.2						29	Felt slightly, Upper valley of the River Kokai, Ibaraki Prefecture. *v.*
		S	〃	32	33.8							
		ME	〃	〃	33.8	+50						
		MN	〃	〃	33.8		+50					
		F	〃	35	—							
46	27	P	9	51	36.6						546	NE–ern off to the coast of Miyako, Iwate Prefecture, 143°.0 E, 39°.9 N. Felt area 314000 sq. km. *v.*
		S	〃	52	38.9							
		L	〃	52	53.8							
		MN	〃	53	—	+850				3.3		
		ME	〃	53	—		+550			2.5		
		MZ	〃	54	54			+450		3.0		
		C	10	09	—							
		F	20	00								
47	28	P	15	36	48.1						550	NE–ern off to the coast of Miyako, Iwate Prefecture, 143°.0 E, 39°.9 N. Felt area 271000 sq. km. *v.*
		P?	〃	37	11.6							
		S	〃	38	00.1							
		MN	〃	39	32.1	+480				4.5		
		ME	〃	40	57.2		+470			4.0		
		C	〃	46	—							
		F	〃	56	—							
48	28	P	21	09	21.6						48	Felt moderately, Lower valley of the River Kinu. *v.*
		S	〃	09	29.4							
		F	〃	15	—							
49	31	P	7	27	06.4						445	NE off to the coast of Miyako, Iwate Prefecture 143°.0 E, 39°.9 N. Felt area 271000 sq. km. *v.*
		S	〃	28	03.4							
		MN	〃	30	33.0	+110				3.0		
		ME	〃	28	44.0		−100			1.3		
		F	〃	45	—							
50	31	P	12	33	28.6						ENE 114 D42	Felt slightly, Off the coast of Kasimanada, Ibaraki Prefecture. *v.*
		S	〃	〃	41.7							
		MN	〃	〃	46.3							
		ME	〃	〃	48.0							
		F	〃	45	—							

June

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion	Δ	Intensity, Epicentre and Remarks.
51	1	P	12	24	36.6						543	Eastern off to the coast of Miyako, Iwate Prefecture, 143°.5 E, 39°.7 N. Felt area 66600 sq. km. *v.*
		iP	〃	24	55.2							
		S	〃	25	38.4							
		MN	〃	26	07	±17				3.4		
		ME	〃	26	18		±10			4.2		
		F	〃	42	—							
52	1	iP	13	13	32.5					W 3	541	Eastern off to the coast of Miyako, Iwate Prefecture, 143°.3 E, 39°.8 N. Felt area 247300 sq. km. *v.*
		S	〃	14	36.5					S 2		
		MN	〃	16	14	+560				3.7 U 2		
		ME	〃	16	07		+250			3.7		
		F	to after shock.									
53	3	P	7	18	59.0						26	Felt slightly, Mouth of the River Edo, Tokyo Prefecture. *v.*
		S	〃	19	06.5							
		MN	〃	〃	06.7	+8						
		ME	〃	〃	06.7		−7					
		F	〃	22	20							
54	3	eP	8	35	45.6						922	Neighbourhood of Amakusa Island, Kumamoto Prefecture, 131°.0 E, 32°.5 N. Felt area 58400 sq. km. *v.*
		iS	〃	37	13.6							
		MN	〃	〃	16	−90				6.6		
		ME	〃	〃	26		±25			7.0		
		F	9	06	50							
55	3	eP	9	23	11						925	After shock of No. 54. *v.*
		iS	〃	25	19							
		F	〃	29	—							
56	5	P	5	57	52.5						1087	After shock of No. 54. *v.*
		cS	6	00	45.5							
		MN	〃	02	01	±5				4.0		
		ME	〃	01	58		±5			3.0		
		F	〃	13	—							
57	11	P	9	06	17.0						46	Felt slightly, Lower valley of the River Iinuma, Tiba Prefecture. *v.*
		S	〃	〃	25.2							
		MN	〃	〃	35.4	−10						
		ME	〃	〃	26.4		±9					
		F	〃	12	18.0							
58	15	eP	6	19	16.0							Distant earthquake. *v.*
		iP	〃	19	50							

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion	Δ μ Km	Intensity, Epicentre and Remarks.
		S	〃	25	23							
		ME	〃	27	18		±27		9.0			
		MN	〃	26	44	±19			9.0			
		F	7	30	—							
59	21	e	10	51	22							Distant earthquake.
		S?	〃	59	58							*v.*
		eF	11	37	—							
60	21	eP	16	36	30							Distant earthquake.
		S	〃	43	47							*u.*
		F	17	36	—							
61	29	eP	23	01	34							Distant earthquake.
		eS	〃	17	45							*u.*
		F	〃	41	—							

July

No.	Date	Phase	G.M.T. h	m	s	Amplitude AN μ	AE μ	AZ μ	Period s	First motion	Δ μ Km	Intensity, Epicentre and Remarks.
62	6	P	22	53	19.4						57	Felt slightly, Uraga Straits, Kanagawa Prefecture. *v.*
		S	〃	〃	29.9							
		MN	〃	〃	30.0	±440						
		ME	〃	〃	30.0		+480					
		F	〃	56	20							
63	7	P	8	40	47						462	Kii Straits, Wakayama Prefecture, 134°.9 E, 33°.9 N. Felt area 87000 sq. km. *v.*
		S	〃	41	52							
		MN	〃	〃	53	±410					3.1	
		ME	〃	〃	54		±320				3.1	
		F	〃	45	50							
64	7	P	18	02	17.6						815	Eastern off to the cape of Erimo, 144°.7 E, 42°.1 N. Felt area 250000 sq. km. *v.*
		S	〃	03	53.7							
		MN	〃	04	12.0	+95					3.2	
		ME	〃	04	00.0		+70				3.1	
		F	〃	22	18							
65	9	P	21	32	26							Distant earthquake. *v.*
		S	〃	39	31							
		F	22	33	—							
66	10	P	1	17	13.4						E 9 N 3 U 89	15 Felt slightly, Lower valley of the River Edo. *v.*
		S	〃	〃	18.2							
		MN	〃	〃	18.3	−330						
		ME	〃	〃	18.3		+280					

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First Motion	Δ μ Km	Intensity, Epicentre and Remarks.
		F	〃	19	23							
67	15	P	11	32	06.3							61 Felt slightly,
		S	〃	〃	14.3							Neighbourhood of Mount
		M_N	〃	〃	14.4	−72						Tanzawa, Kanagawa Pre-
		M_E	〃	〃	14.4		+110					fecture.
		F	〃	37	—							*v*.
68	31	P	19	29	42.1							572 Eastern off to the coast
		S	〃	30	50.2							of Miyako, Iwate Prefec-
		M_N	〃	〃	50.2	±60					3.0	ture,
		M_E	〃	〃	50.2		±70				1.0	143°.5 E, 40°.1 N.
		F	〃	39	—							*v*.

August

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First Motion	Δ μ Km	Intensity, Epicentre and Remarks.
69	1	eP	2	55	45.0							872 Off the coast of Kusiro,
		S	〃	57	13.0							Hokkaido.
		F	3	02	—							*v*.
70	2	P	2	52	10.4							214 Off the Hatizyo Island.
		S	〃	〃	35.9							*v*.
		M_N	〃	〃	〃	+50						
		M_E	〃	〃	〃		−40					
		F	〃	57	—							
71	13	P	22	31	28.5							14 Felt slightly,
		S	〃	〃	33.0							Lower valley of the River
		M_N	〃	〃	〃	−130						Tama-gawa, Tokyo Pre-
		M_E	〃	〃	〃		−430					fecture.
		F	〃	34	30							*v*.
72	14	P	8	26	11.4							40 Felt slightly,
		S	〃	〃	20.8							Neighbourhood of City
		M_N	〃	〃	〃	+200						of Tiba, Tiba Prefecture.
		M_E	〃	〃	〃		+214					*v*.
		F	〃	32	—							
73	14	P	16	37	22.2							40 Felt slightly,
		S	〃	〃	30.8							Lower valley of the River
		M_N	〃	〃	31.0	+100						Tone, Tiba Prefecture.
		M_E	〃	〃	31.0		−150					*v*.
		F	〃	40	—							
74	16	P	3	50	57.0							1000 Western off to the coast

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
		S	3	52	21.3						of	Titizima I.
		M_N	〃	〃	22.0	+37					*v.*	
		M_E	〃	〃	26.0		−37					
		F	〃	57	—							
75	16	P	16	45	46.0						550	Eastern off to the mouth of the River Kuzi, Iwate Prefecture. 142°.3 E, 40°.4 N Felt area 141000 sq. km.
		S	〃	46	56.0							
		F	〃	52	—							*v.*
76	26	P	13	30	05.4						174	Felt slightly, NNE-ern off to Miyake I., Tokyo Prefecture.
		S	〃	〃	24.7							
		M_N	〃	〃	26.0	±57						
		M_E	〃	〃	〃		±77					*v.*
		F	〃	35	—							
77	26	P	18	11	53.1						158	Felt slightly, Coast of Kasimanada,
		S	〃	12	09.0							
		M_N	〃	〃	29.0	−430			1.9			141°.1 E, 36°.4 N.
		M_E	〃	〃	17.0		−240		2.0			Felt area 336000 sq. km.
		F	〃	25	—							*v.*
78	27	P	17	59	49.1						372	Felt slightly, SW-ern off to the coast of the Hatizyo Island. 139°.0 E, 32°.5 N.
		S	18	00	35.2							
		M_E	〃	〃	—		+50					
		M_N	〃	〃	—	+70						
		F	〃	06	—							*v.*

September

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
79	1	eP	6	19	27							Distant earthquake.
		cS	〃	27	38							*u.*
		eL	〃	45	32							
		M_E	〃	52	02		+75			11.5		
		F	7	31	—							
80	7	eP	2	57	04.7							Distant earthquake.
		F	3	07	—							*r.*
81	13	eP	3	33	20							Distant earthquake.
		F	〃	56	—							*r.*

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
82	17	iP	16	01	39.7					E	10	Felt slightly,
		iS	〃	〃	46.3					N		Mouth of the River Edo,
		M_E	〃	〃	〃		+145		—	D		Tokyo Prefecture.
		M_N	〃	〃	〃	−42			—			v.
		F	〃	03	—							
83	22	eP	7	40	54.2							Distant earthquake.
		F	8	51	—							r.
84	23	iP	6	56	34.0					W	368	Felt slightly,
		eS	〃	57	05.4					S 1.5		The Koizumi Bay, Miya-
		M_E	〃	〃	19.3		−47		0.9	U 4.0		gi Prefecture,
		M_N	〃	58	39.0	−52			1.4			141°.5 E, 38°.8 N.
		M_Z	〃	〃	49.3			−30	1.3			Felt area 142400 sq. km.
		F	7	10	—							v.
85	25	eP	5	00	22.7						726	Eastern part of Suo-nada,
		eS	〃	02	07.1							the Seto inland sea,
		M_N	〃	03	16.9	−43			4.3			131°.9 E, 33°.7 N.
		M_E	〃	〃	17.0		+29		3.5			Felt area 130000 sq. km.
		F	〃	08	50							v.
86	29	eP	21	18	31.2						210	Felt slightly,
		eS	〃	〃	48.7							ESE-ern off to Cape
		M_N	〃	19	12.5	+70			1.3			Sioya, Hukusima Prefec-
		M_E	〃	〃	08.6		−78		1.3			ture.
		F	〃	〃	24							141°.5 E, 36°.6 N.
												Felt area 62900 sq. km.
												v.

October

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
87	5	iP	6	58	37.1						42	Felt rather strongly,
		iS	〃	〃	45.5							Midde valley of the River
		M_N	〃	〃	46.8	−3300			1.2			Arakawa, Saitama Pre-
		M_E	〃	〃	46.5		−2950		1.7			fecture. 139°.6 E, 36°.1 N.
		M_Z	〃	〃	51			+1700	1.2			Felt area 70000 sq. km.
		F	7	09	05							v.
88	6	iP	11	08	18.4					W 3	90	Felt slightly,
		iS	〃	〃	32.7					S 1		SE-ern off to the coast of
		F	〃	10	38							Katuura, Tiba Prefec-
												ture.
												r,

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First Motion μ	Δ Km	Intensity, Epicentre and Remarks.
89	7	iP	1	59	34.0						0	Felt slightly,
		iS	〃	〃	40.3							Neighbourhood of
		M_N	〃	〃	41	−34				−		Tokyo.
		M_E	〃	〃	〃		+28			−		*d.*
		F	2	03	—							
90	7	iP	13	59	34.0						46	Felt slightly,
		iS	〃	〃	40.3							Lower valley of the River
		M_N	〃	〃	41	+74					0.8	Kinu, Ibaraki Prefec-
		M_E	〃	〃	41		−73				0.9	ture.
		F	14	03	—							*v.*
91	11	eP	23	38	10							Distant earthquake.
		eF	24	54	—							*r.*
92	12	eP	7	32	52							Sea of Okhotsk.
		eS	〃	40	20							*r.*
		F	9	05	—							
93	12	iP	15	42	54.4						41	Felt slightly,
		iS	〃	43	02.2							Neighbourhood of the
		M_N	〃	〃	02.9	−70						Inba marsh, Tiba Pre-
		M_E	〃	〃	02.9		+138					fecture.
		F	〃	44	15							*v.*
94	13	eP	15	24	40							Distant earthquake.
		F	〃	48	—							*r.*
95	15	iP	6	38	34.0						52	Felt slightly,
		iS	〃	〃	42.4							Lower valley of the River
		M_N	〃	〃	47.6	±71					0.3	Kokai, Ibaraki Prefec-
		M_E	〃	〃	43.1		±54			−		ture.
		F	〃	43	24							*v.*
96	15	eP	14	30	01							Distant earthquake.
		eS	〃	38	13							*u.*
		F	15	52	—							
97	17	iP	3	29	13.3						73	Felt slightly,
		iS	〃	〃	23.7							Lower valley of the River
		M_N	〃	〃	24.9	±150					0.4	Sakawa, Kanagawa Pre-
		M_E	〃	〃	23.9		±87				0.4	fecture.
		F	〃	37	24							*v.*
98	17	iP	14	45	49.3						58	Felt slightly,
		iS	〃	〃	57.3							Lower valley of the River
		M_N	〃	〃	58.0	±16					0.3	Kokai, Ibaraki Prefec-
		M_E	〃	〃	57.4		±14				0.3	ture.
		F	〃	48	10							*v.*

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First Motion μ	Δ Km	Intensity, Epicentre and Remarks.
99	26	eP	15	45	04.0						250	Felt slightly,
		iS	〃	〃	46.2							The Bay of Atumi, Aiti
		M_N	〃	〃	46.8	±17			—			Prefecture, deep seated
		M_E	〃	〃	47.0		±16		—			origin.
		F	〃	48	00							*v*.

November

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First Motion μ	Δ Km	Intensity, Epicentre and Remarks.
100	5	iP	17	49	58.6						16	Felt slightly,
		iS	〃	50	04.0							Mouth of the River Roku-
		M_E	〃	〃	〃		−140		—			go, Kanagawa Prefecture.
		M_N	〃	〃	〃	−57			—			*v*.
		F	〃	53	—							
101	6	eP	4	15	31							Distant earthquake.
		eS	〃	24	28							*u*.
		eL	〃	32	15							
		F	5	09	59							
102	10	eP	20	46	33.7						550	Off the mouth of the
		eS	〃	47	53.7							River Kuzi, Iwate Pre-
		F	〃	52	30.0							fecture, 142°.0 E, 40°.4 N.
												Felt area 83000 sq. km.
												v.
103	16	eP	11	05	31							Distant earthquake.
		F	〃	30	—							*r*.
104	28	eP	10	51	46							Distant earthquake.
		F	11	11	—							*r*.

December

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion μ	Δ Km	Intensity, Epicentre and Remarks.
105	1	eP	4	26	13							Distant earthquake,
		eS?	〃	42	24							Chile, South America.
		eL	5	19	03							*u*.
		M_E	〃	22	18		±875		32.5			
		M_N	〃	32	20	±300			17.6			
		F	6	48	—							

No.	Date	Phase	G.M.T. h	m	s	Amplitude A_N μ	A_E μ	A_Z μ	Period s	First motion	Δ Km	Intensity, Epicentre and Remarks.
106	2	eP	4	42	—							Distant earthquake,
		eS	〃	54	—							Chile, South America.
		eL	5	33	—							*u.*
		F	7	07	—							
107	7	eP	9	23	25							Distant earthquake.
		eS	〃	33	03							*u.*
		eL	〃	35	25							
		F	10	15	25							
108	9	eP	0	06	15							Distant earthquake,
		eS?	〃	20	15							*u.*
		F	〃	48	—							
109	9	eP	2	58	45.4						55	Felt slightly,
		iS	〃	〃	54.4							Lower valley of the River
		M_E	〃	〃	〃		−37		−			Kokai, Ibaraki Prefec-
		M_N	〃	〃	〃	+31			−			ture.
		F	3	03	—							*v.*
110	9	eP	5	14	14							Distant earthquake.
		eS?	〃	27	44							*u.*
		F	7	05	—							
111	12	eP	20	31	40.6							Distant earthquake.
		F	21	50	—							*r.*
112	13	iP	20	06	19.8					W 6.7	100	Felt slightly,
		iS	〃	06	35.1					N 1.2		Off the coast of Kuzyu-
		M_E	〃	〃	40.3		−320		2.0	U 50		kuri, Tiba Prefecture,
		M_N	〃	〃	36.7	±323			2.3			140°.9 E, 35°.4 N.
		M_Z	〃	08	02.0			+104	3.4			Felt area 13690 sq. km.
		F	〃	21	—							*r.*
113	18	eP	16	07	10.8						660	ESE-ern off to the cape
		eS	〃	08	05.2							of Ezan, Hokkaido Dis-
		F	〃	10	40							trict, 141°.6 E, 41°.5 N.
												Felt area 40660 sq. km.
												r.
114	19	eP	11	44	08.2							Distant earthquake.
		eS	〃	51	09.3							*r.*
		M_N	〃	58	32.1	±453			11.7			
		M_E	〃	57	11.7		±210		8.7			
		F	13	15	—							
115	28	eP	14	27	10							Distant earthquake.
		eS?	〃	33	23							*r.*
		F	15	39	—							

TABLE II.

LIST OF REMARKABLE EARTHQUAKES.

No.	Time of Occurrence	Epicenter	Remarks
1	Feb. 3rd 18h 49m	Southern off to the cape of Kinkwazan. $\lambda = 141^{\circ}.3$ E $\varphi = 37^{\circ}.6$ N	Felt at almost all the part of the districts of Tohoku, Kwanto and South-eastern part of Hokkaido.
2	Feb. 11th 21h 10m	Lower valley of the River Kokai. $\lambda = 140^{\circ}.0$ E $\varphi = 36^{\circ}.1$ N	Felt at the whole part of the Kwanto and from middle part to north-eastern part of Honsyu.
3	Mar. 29th 5h 07m	South-eastern off to the Hatizyo Island. $\lambda = 138^{\circ}.2$ E $\varphi = 32^{\circ}.4$ N	Deep earthquake, Felt area shows abnormal distribution, namely, felt at the whole part of Kwanto, and some part of Southern Honsyu, and the neighbourhood of Hikone and Okayama separately. Depth of focus is about 400 km.
4	May 20th 16h 29m	North-eastern part of the Bay of Tokyo. $\lambda = 140^{\circ}.1$ E $\varphi = 35^{\circ}.6$ N	Felt at almost all the part of Honsyu (Main Island of Japan). Felt strongly at Tokyo and Yokohama. This quake was the greatest one among those occurred in this year.
5	May 27th 9h 50m	North-eastern off to the coast of Miyako. $\lambda = 142^{\circ}.8$ E $\varphi = 40^{\circ}.2$ N	Felt area was very wide, Felt at almost all the part of Honsyu and Southern part of Hokkaido.
6	June 1st 13h 11m	Eastern off to the coast of Miyako. $\lambda = 143^{\circ}.3$ E $\varphi = 39^{\circ}.8$ N	Felt at the whole part of North-eastern district of Honsyu, northern part of Kwanto and some part of Hokkaido.
7	Sept. 23rd 6h 55m	Vicinity of the Bay of Koizumi. $\lambda = 141^{\circ}.5$ E $\varphi = 38^{\circ}.8$ N	Felt at the most part of Tohoku (North-eastern part of Honsyu)and Kwanto district.

TABLE III.

LIST OF MODERATE EARTHQUAKES.

No.	Time of Occurrence				Epicentre
1	Jan.	1st	07h	17m	Lower valley of the River Kinu, Ibaraki Prefecture. $\lambda=140^\circ.0\,\mathrm{E}$ $\varphi=36^\circ.0\,\mathrm{N}$
2	Feb.	20th	03	02	Upper valley of the River Takahasi, Okayama Prefecture. $\lambda=133^\circ.4\,\mathrm{E}$ $\varphi=34^\circ.9\,\mathrm{N}$
3	Mar.	23rd	01	21	Middle valley of the River Nakagawa, Saitama Prefecture. $\lambda=139^\circ.8\,\mathrm{E}$ $\varphi=36^\circ.0\,\mathrm{N}$
4	Apr.	12th	16	36	Middle valley of the River Kokai, Ibaraki Prefecture. $\lambda=140^\circ.1\,\mathrm{E}$ $\varphi=36^\circ.2\,\mathrm{N}$
5	May	19th	09	32	Kasimanada, Ibaraki Prefecture. $\lambda=140^\circ.3\,\mathrm{E}$ $\varphi=36^\circ.6\,\mathrm{N}$
6		28th	15	36	Eastern off to the coast of Miyako, Iwate Prefecture. $\lambda=143^\circ.0\,\mathrm{E}$ $\varphi=39^\circ.9\,\mathrm{N}$
7		31st	07	26	ENE-ern off to the coast of Miyako, Iwate Prefecture. $\lambda=140^\circ.0\,\mathrm{E}$ $\varphi=39^\circ.9\,\mathrm{N}$
8	June	1st	12	23	Eastern off to the coast of Miyako, Iwate Prefecture. $\lambda=143^\circ.5\,\mathrm{E}$ $\varphi=39^\circ.7\,\mathrm{N}$
9		3rd	08	31	Neighbourhood of the Amakusa Island, Kumamoto Prefecture. $\lambda=130^\circ.1\,\mathrm{E}$ $\varphi=32^\circ.4\,\mathrm{N}$
10	July	7th	08	39	Middle part of Kii Straits, Wakayama Prefecture. $\lambda=134^\circ.9\,\mathrm{E}$ $\varphi=33^\circ.9\,\mathrm{N}$
11		7th	18	00	Eastern off to the cape of Erimo, Hokkaido district. $\lambda=144^\circ.7\,\mathrm{E}$ $\varphi=42^\circ.1\,\mathrm{N}$
12		31st	19	39	Eastern off to the coast of Miyako, Iwate Prefecture. $\lambda=143^\circ.5\,\mathrm{E}$ $\varphi=40^\circ.1\,\mathrm{N}$
13	Aug.	16th	16	44	Eastern off to the mouth of the River Kuzi, Iwate Prefecture. $\lambda=142^\circ.3\,\mathrm{E}$ $\varphi=40^\circ.4\,\mathrm{N}$

No.	Time of Occurrence			Epicentre
14		26th	18 11	Kasimanada, Ibaraki Prefecture. $\lambda=141^{\circ}.1\,\mathrm{E}$ $\varphi=36^{\circ}.4\,\mathrm{N}$
15		27th	17 59	South-western off to the Hatizyo Island. $\lambda=139^{\circ}.0\,\mathrm{E}$ $\varphi=32^{\circ}.5\,\mathrm{N}$
16	Sept.	25th	04 58	Eastern part of Suo Nada, Yamaguti Prefecture. $\lambda=131^{\circ}.9\,\mathrm{E}$ $\varphi=35^{\circ}.7\,\mathrm{N}$
17		29th	21 17	ESE-ern off to Cape Sioya, Hukusima Prefecture. $\lambda=141^{\circ}.5\,\mathrm{E}$ $\varphi=36^{\circ}.6\,\mathrm{N}$
18	Oct.	5th	20 52	Western off to the cape of Erimo, Hokkaido district. $\lambda=142^{\circ}.4\,\mathrm{E}$ $\varphi=41^{\circ}.9\,\mathrm{N}$
19	Nov.	10th	20 45	Off the mouth of the River Kuzi, Iwate Prefecture. $\lambda=142^{\circ}.0\,\mathrm{E}$ $\varphi=40^{\circ}.4\,\mathrm{N}$
20	Dec.	13th	20 06	Off the coast of Kuzyukurihama, Tiba Prefecture. $\lambda=140^{\circ}.9\,\mathrm{E}$ $\varphi=35^{\circ}.4\,\mathrm{N}$
21		18th	16 04	ESE-ern off to the cape of Esan, Hokkaido district. $\lambda=141^{\circ}.6\,\mathrm{E}$ $\varphi=41^{\circ}.5\,\mathrm{N}$
22		21st	23 17	Upper valley of the River Kikuti, Kumamoto Prefecture. $\lambda=130^{\circ}.9\,\mathrm{E}$ $\varphi=33^{\circ}.0\,\mathrm{N}$

Note on The principal Earthquakes in the Year 1928.

1. Earthquake occurred at about 18h49m, on Feb. 3, 1928.

This earthquake was felt in the southern half of Tohoku, and a part of the Kwanto districts, and also slightly at Kusiro in Hokkaido, showing thus a phenomenon of somewhat anomalous felt area. The epicenter lies at 85 km. south by west off to the coast of Kinkwasan, its geographical coordinates are 141°.3 E, 37°.6 N.

The seismic intensities observed at the meteorological stations are as follows :—

Seismic Intensity
- Rather Strong ; Onahama.
- Moderate ; Utunomiya, Mt. Tukuba, Isinomaki, Sendai, Mito, Kakioka, Yamagata, Tyosi, Miyako, Morioka, Tokyo, Aidu, Kusiro.

Some of the seismometrical data reported from the metcorological stations are shown in the following table :—

Station	Time of Occurrence			Duration of PS		First Motion			Max. Amp.		
						N	E	U	N	E	U
	h	m	s	m	s	μ	μ	μ	μ	μ	μ
Hukusima	18	49	12.–		13.6	–114	62		–600	476	
Isinomaki			27.2		14.2	–10	6	(D)	135	250	
Sendai			29.0		13.0	–80	49	(U)	222	329	
Kakioka			33.2		18.6	9	14	(D)	370	–183	±90
Kumagaya			45.0		26.3	3	2	–5	199	–136	–77
Mera			55.5		44.4				70	166	–19
Numadu		50	03.5		41.0						
Gihu			24.1		47.8	(N)	(E)		38	–25	
Kyoto			30.0	1	21.1						
Sumoto			46.5	1	27.7	1	1		–16	–9	

2. Earthquake occurred at about 21h10m, on Feb. 11, 1928.

Very wide area covering the whole part of Kwanto, the middle part of Honsyu, and the southern part of Tohoku districts were shaken. The epicenter lies at 140°.0 E and 36°.1 N ; and is situated at the lower valley of the River Kokai at about 28 km. south-west to Mt. Tukuba.

The seismic intensities observed at the meteorological stations are as follows :—

Seismic Intensity
Strong ; Mito, Kakioka, Kumagaya, Yokohama, Utunomiya,
Rather Strong ; Tokyo, Maebasi, Kohu, Yokosuka, Onahama, Nagano.
Moderate ; Tyosi, Aidu, Oiwake, Numadu, Asio,
Slight ; Mera, Takada, Matumoto, Takayama, Yamagata, Sendai.

The seismometrical data reported from the meteorological stations are shown in the following table :—

Station	Time of Occurrence			Duration of PS		First Motion N	First Motion E	First Motion U	Max. Amp. N	Max. Amp. E	Max. Amp. U
	h	m	s	m	s	μ	μ	μ	μ	μ	μ
Kakioka	21	10	26.3		6.0	381	682	602	4000	3490	2800
Kumagaya			27.4		8.0	−5	104	−14	14800	−14300	763
Tokyo			28.4		8.7	−118	−57	434	−1650	−2600	−614
Tyosi			33.0		18.4	−8	16	65	−845	880	
Mera			36.3		12.0	(S)	(W)		381	451	454
Numadu			45.0		15.7	1	2		−1300	−1140	
Sendai			53.1		27.6	−9	−4	−12	−527	428	130
Kyoto	11		06.8		53.9				−123	58	
Siomisaki			10.4		55.7				−56	−42	
Koti			11.6	1	24.5				−21		
Hamada			46.6	1	42.5				25	11	

3. Earthquake occurred at about 5h06m, on Mar. 29, 1928.

This earthquake was one of the deep-seated origin, and the shock was felt at Hikone and Okayama slightly, besides the Kwanto and Tohoku districts, thus showing a phenomenon of the so-called anomalous felt area.

The epicenter lies at 138°.2 E and 32°.4 N ; and about 220 km. south west to Hatidyozima. The depth of the hypocenter of this earthquake, determined by means of the durations of the preliminary tremor was about 400 km. The earthquake will be considered probably to be one of the deep seated origin of the volcanic character occurred in the magma layer underlying so-called Naumann's Fossa Magma.

The seismic intensities observed at the meteorological stations are as follows :—

Seismic Intensity
- Rather Strong ; Mt. Tukuba, Yokohama, Tokyo, Kakioka.
- Moderate ; Kumagaya, Utunomiya, Aidu, Hukusima, Onahama.
- Slight ; Hatidyozima, Hikone, Tyosi, Mito, Okayama, Kohu, Midusawa, Akita, Morioka.

Some of the seismometrical data reported from the meteorological stations are shown in the following table :—

Station	Time of Occurrence			Duration of PS		First Motion			Max. Amp.		
						N	E	U	N	E	U
	h	m	s	m	s	μ	μ	μ	μ	μ	μ
Hatidyozima	5	07	02.		50.						
Siomisaki			04.2		49.4	11	−10	38	594	310	−313
Numadu			12.7	1	01.2	−25	20		1950	>−489	
Mera			13.3		58.5	(N)	(E)	−6	>290		161
Wakayama			14.0	1	00.0	4	7		352	±180	±23
Muroto			14.5		57.2	−7	−10		167	312	
Nagoya			15.8		51.6	(S)	−4	−4		−613	−156
Kyoto			16.1		57.7	6	−3	6	313	213	−50
Sumoto			16.1		56.4	4	−6	6	363	188	−52
Yokohama			17.9		56.1				1500	−2750	215
Tokyo			18.3		59.8			−15	−1750	1500	−341
Kumagaya		1	21.4		01.4	−2	1	−6	388	410	−272
Koti			21.6		58.9	5	−9	13	1781	−2156	66
Kakioka		1	24.6		01.6	−36	−18	−19	>450	925	−525
Toyooka		1	26.5		03.7	−5	−2		−513	−250	
Nagano		1	28.7		04.7	4	−4	2	−625	−910	460
Hirosima		1	33.2		11.5	−2	−4		278	730	
Hamada		1	36.2		08.9				306	−345	−226
Miyazaki		1	36.4		09.7	−4	−8	15	206	−500	−288
Onahama		1	45.3		08.2	−40				1490	
Isinomaki		1	49.7		21.6	−0.	0.		240	465	
Nagasaki		1	50.0		22.7				196	894	

Station	Time of Occurrence			Duration of PS		First Motion N	First Motion E	First Motion U	Max. Amp. N	Max. Amp. E	Max. Amp. U
	h	m	s	m	s	μ	μ	μ	μ	μ	μ
Akita		08	03.8	1	32.7	(N)	(W)	−3	537	−320	−325
Hakodate			30.5	1	37.	−10	−7		1580	−1160	
Kusiro			56.3	2	15.0	14	3		380	−222	

4. Earthquake occurred at about 16h29m, on May 20, 1928.

This earthquake shook Tokyo and Yokohama very strongly, and the felt area covered the whole part of Kwanto, the greater part of the middle part of Honsyu and Tohoku districts, and was felt also in the northern part of Hokkaido and at Toyooka,

The epicenter lies at 140°.1 E and 35°.6 N ; the coast of Tiba, the northeastern part of the Bay of Tokyo, and about 28 km. east by south to Tokyo.

The hypocenter of this earthquake is considered to lie somewhat deep, and the depth was obtained to be about 55 km. by the use of the S. I. Kunitomi's formula using the minor axis of the iso-PS ellipse,

According to K. Sagisaka who studied this earthquake precisely, the depth seems to be about 60 km. and it was proved by the investigation of the direction of initial motion that the earthquake was a fault one occurred at the deeper layer of the earth crust.

The seismic intensities observed at the meteorological stations are as follows :—

Seismic Intensity

Very Strong ; Tokyo, Yokohama.
Strong ; Kakioka.
Rather Strong ; Yokosuka, Tyosi, Kumagaya, Mt. Tukuba, Utunomiya, Numadu, Onahama, Hukusima, Aidu.
Moderate ; Asio, Mito, Mera, Kohu, Maebasi, Oiwake, Nagano, Iida, Matumoto.
Slight ; Hatidyozima, Niigata, Takayama, Yamagata, Toyooka, Morioka, Miyako, Kusiro.

Some of the seismometrical data reported from the meteorological stations are shown in the following table :—

(Note ; The data concerning to the magnitude of first motion and the preliminary tremor here are determined by K. Sagisaka from the copies of the original seismograms.)

Station	Time of Occurrence h	m	s	Duration of PS m	s	First Motion N	E	U	Max. Amp. N	E	U
						μ	μ	μ	μ	μ	μ
Tokyo	16	29	23.1		8.7	-58	86	-900	-5600	11000	±2000
Yokohama			24.6		9.6	198	253	-423			
Kakioka			24.8		9.9	180	(W)	140	±3000	±3550	±1350
Mito			25.		12.2	(N)			3000		
Mera			25.6		10.7	34	28	-137	-516	-498	>-415
Tyosi			26.3		10.8	69	130	207			
Kumagaya			28.5		12.6	-220	98	-360	-5500	-5700	>±835
Numadu			35.2		14.0	134	327	-410		-2750	-486
Nagano			43.6		21.5	-84	82	-150	-865	-995	-611
Isinomaki			52.3		36.2	-20	-7		-250	-300	
Nagoya			52.7		36.4	-12	32		145	-175	-272
Siomisaki	30		05.5		56.6	9	19		-61	-70	±26
Kobe			14.1	1	01.0	4	30	-16	-307	278	-195
Akita			16.7		45.2	(S?)	(very slight)		±350	±268	
Koti			36.1	1	16.8		ENE		60	-60	-40
Titizima	31		11.0	1	30.0				±50	±66	

5. Earthquake occurred at about 9h50m, on May 27, 1928.

Very wide area covering the whole part of Tohoku, the southern half of Hokkaido, the greater part of Kwanto, and the northern part of Hokurikudo districts, was shaken.

The epicenter lies at 142°.8 E and 40°.2 N; about 90 km. northeastern off to the coast of Miyako.

Several sea shocks were felt by the S. S. Kitamaru who was making voyage near the epicenter.

The seismic intensities observed at the meteorological stations are as follows:—

Seismic Intensity
- Strong; Miyako, Morioka,
- Rather Strong; Isinomaki, Akita, Hakodate,
- Moderate; Onahama, Sendai, Kusiro, Obihiro,
- Slight; Yamagata, Sapporo, Muroran, Utunomiya, Mito, Kakioka, Niigata, Yokosuka, Nemuro, Tokyo, Numadu, Urakawa, Kohu.

Some of the seismometrical data reported from the meteorological stations are shown in the following table:—

Station	Time of Occurrence h	m	s	Duration of PS m	s	First Motion N μ	E μ	U μ	Max. Amp. N μ	F μ	U μ
Miyako	9	50	32.0		10.0	−112	−130		−3300	−3560	
Morioka			50.2		23.3	1	659				
Isinomaki			59.4		25.0	−4	−4		1450	1144	
Akita		51	01.4		27.0		−6	9	±11300	−6900	−2733
Hakodate			04.0		32.	135	−160				
Kusiro			14.6		37.5	−22	−5		−1530	1280	
Tukubasan			27.5	1	00.0				1960	860	
Tokyo			36.6	1	02.3				850	550	450
Nagano			40.9	1	03.0	−27	−17		3380	1640	−6067
Mera			48.9	1	07.3				391	431	−541
Gihu		52	09.0	1	23.5	4	6		582	−250	
Kyoto			15.5	1	58.2	−9	−6		−425	280	
Koti			45.3	2	34.5				32	−24	15
Miyazaki		53	19.5	2	56.4				−210	219	−200

6. Earthquake occurred at about 13h12m, on June 1, 1928.

This earthquake was felt in the whole part of Tohoku, and the northern part of Kwanto districts and at several places in the coastal region of Hokkaido facing at the Pacific Ocean.

The epicenter lies at 143°.3 E and 39°.8 N, and at adout 110 km. eastern off to the coast of Miyako.

The seismic intensities observed at the meteorological stations are as follows:—

Seismic Intensity
- Very Strong; Miyako.
- Strong; Morioka, Todozaki Light House.
- Rather Strong; Midusawa,
- Moderate; Sendai, Akita, Hukusima.
- Slight; Hakodate, Isinomaki, Yamagata, Aidu, Kusiro, Kakioka, Nemuro, Numadu, Utunomiya, Niigata,

Some of the seismometrical data reported from the meteorological stations are shown in the following table:—

Station	Time of Occurrence			Duration of PS		First Motion N	First Motion E	First Motion U	Max. Amp. N	Max. Amp. E	Max. Amp. U
	h	m	s	m	s	μ	μ	μ	μ	μ	μ
Miyako	13	12	42.		14.0	46	−220			−2546	
Isinomaki			49.8		21.6	−145	−238		725	1360	
Akita	13	00	00.0		35.0	22	−62	84			
Hukusima			05.		23.2	32	32		−144	−108	
Kusiro			12.5		41.4	4	4		960	−928	
Sapporo			17.1		55.2	10	−16	5			−346
Muroran			17.1		36.9				1080		
Kakioka			19.7		57.8	−3	−2	5	>−460	±525	320
Nemuro			20.5		43.1	−3	−2	(D)			
Tokyo			32.5	1	04.0	−27	−40	27	560	250	
Nagano			35.0		59.8	−23	−17	20	−628	−391	442
Gihu	14		01.5	1	13.2	2	4		−184	152	
Kyoto			12.0	1	38.1				290	−87	−38
Siomisaki			28.2	2	22.7				±61	−90	−38
Koti			43.	2	18.0				84	80	
Miyazaki	15		07.8	3	36.5				91	56	−56
Nagasaki			22.4	2	48.4		−5				

7. Earthquake occurred at about 6h55m, on Sept. 23, 1928.

The greater part of Tohoku, and the northern half of the Kwanto districts were shaken by the present earthquake. The epicenter lies at 141°.5 E and 38°.8 N; on the coast of the Bay of Koizumi, Miyagi Prefecture.

The seismic intensities observed at the meteorological stations are as follows:—

Seismic Intensity
- Strong; Miyako.
- Rather Strong; Isinomaki, Midusawa, Hukusima.
- Moderate; Yamagata, Akita, Onahama, Kakioka.
- Slight; Mito, Utunomiya, Tokyo, Aidu, Kusiro,

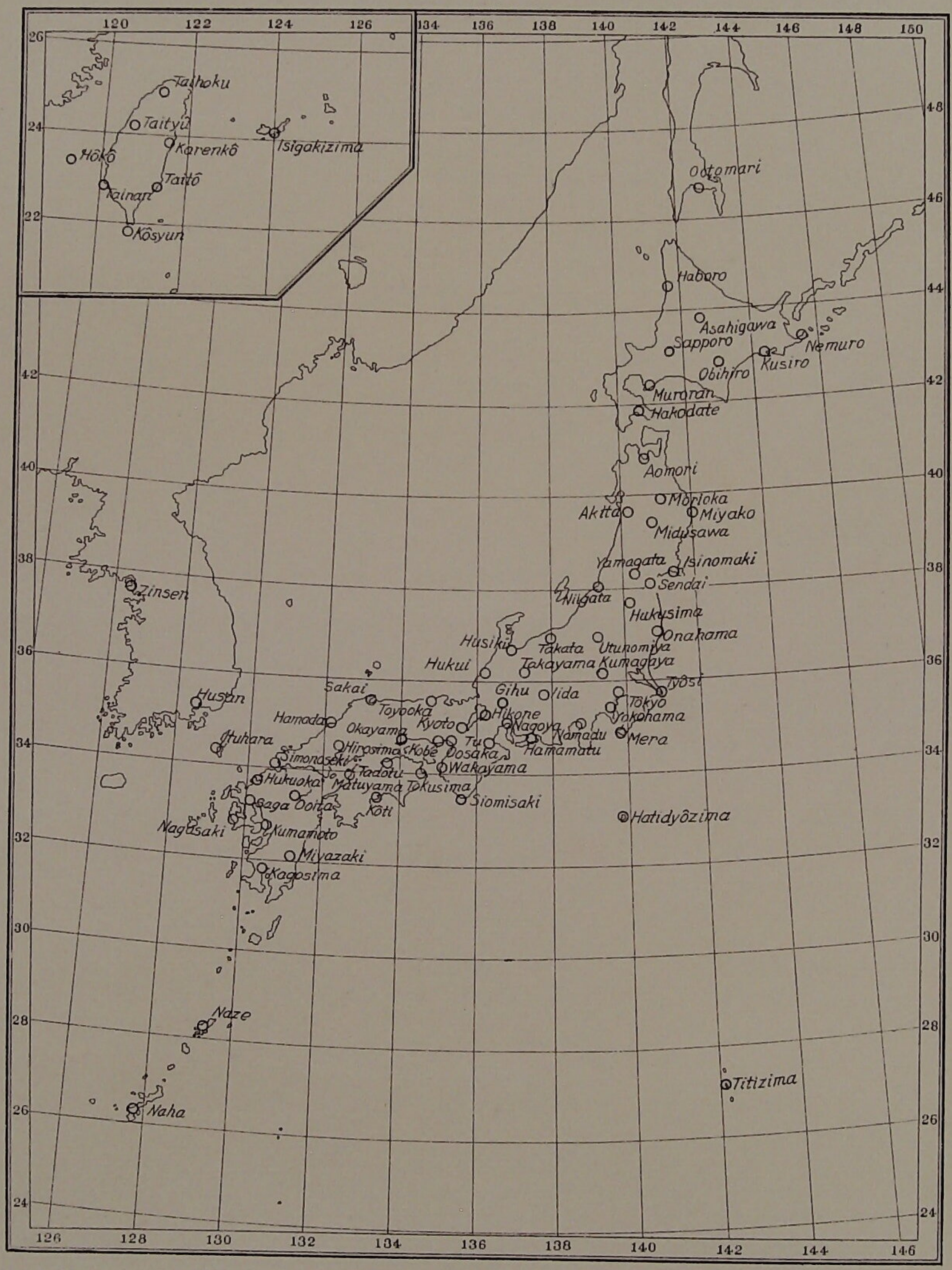
Some of the seismometrical data reported from the meteorological stations are shown in the following table :—

Station	Time of Occurrence			Duration of PS		First Motion N			Max. Amp. N		
	h	m	s	m	s	μ	μ	μ	μ	μ	μ
Isinomaki	6	55	54.6		7.7	−16	−13		−850	−710	
Miyako	56	00.0		13.		150	−88		446	−420	
Yamagata		01.3		15.9		2			−434		
Akita		07.0		20.8		−1	2	−7	28	−26	−11
Hukusima		16.		16.4		−11	−15		−652	−452	
Aomori		17.		16.6		27		−10	−405	552	
Kakioka		24.0		35.8		−8	−7	5	±242	±145	
Tokyo		34.0		31.4		−2	(W)	4	−52	−47	−30
Mera		42.9		38.1					−21	−28	9
Sapporo		45.0		59.4					−18	−24	
Kusiro		49.1		47.6		−16	−6		112	140	
Nemuro		56.7			56.1		1	−1	1		
Koti	58	06.7		1	28.0						

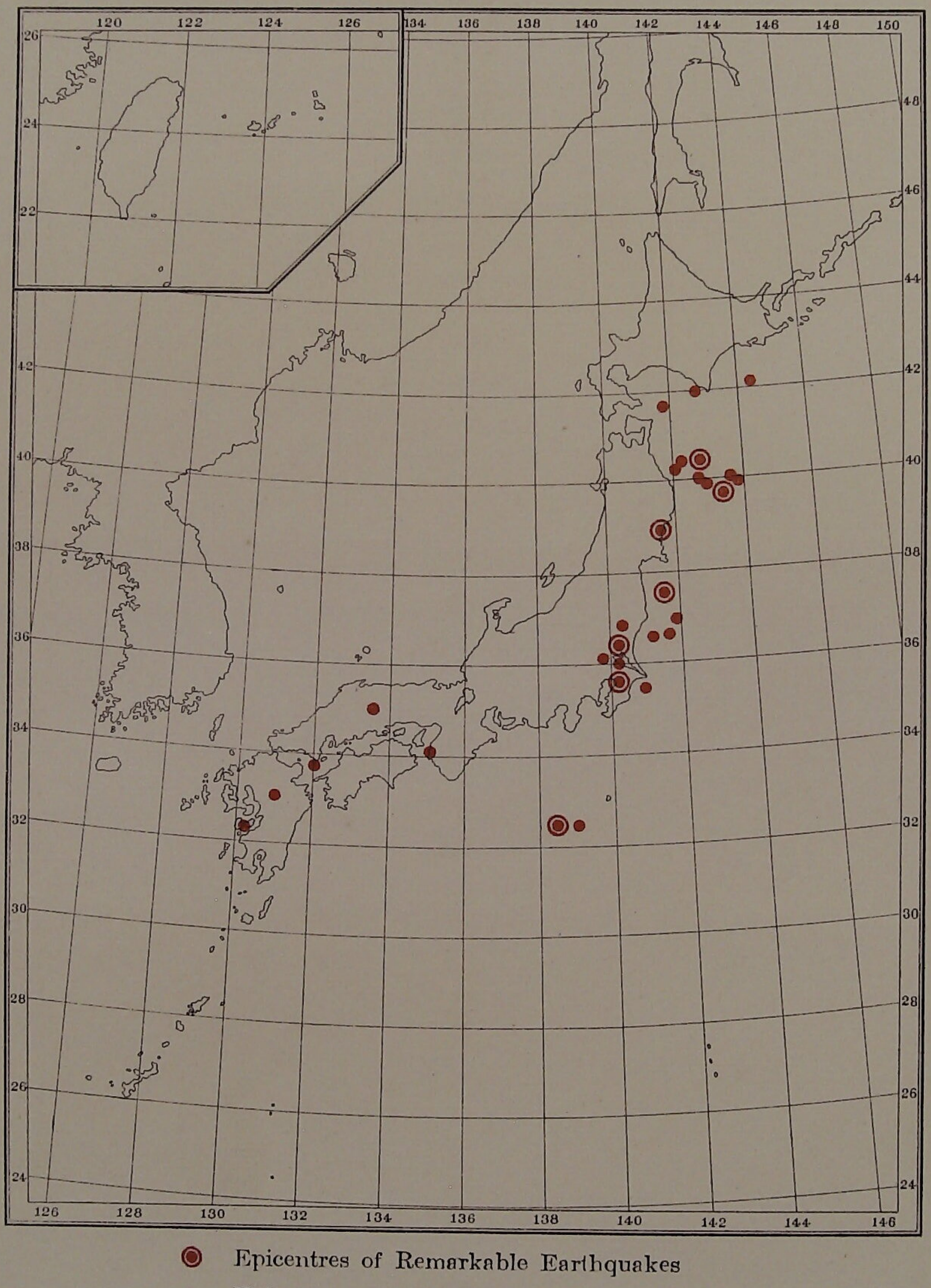
List of Volcanic activities in the year 1928.

Name of Volcano	Date		Remarks
	Day	Time	
Tarumaye			
$\lambda = 141^\circ.4$ E	Jan. 4th	2h —	Faint black smokes were emitted.
$\varphi = 42^\circ.7$ N	Jan. 7th	0h to 16h 30m	Black smokes were emitted. Those smokes climbed up as high as three times of its ordinary height.
Asama-yama			
$\lambda = 138^\circ.7$ E	Feb. 23rd	7h16m45s	Enormous volume of smokes and vapour were emitted with tremendous sounds.
$\varphi = 36^\circ.4$ N	June 20th	10 30	Ashes fell in the City of Maebasi.
	July 7th	2 46	Enormous volume of smokes was emitted. Ashes fell in Tateno (the aerological observatory).
	July 12th	0 11	Smokes were emitted with tremendous sound.
	July 13th	21 —	Tremendous sound was heard.
Huyo-dake.			
$\lambda = 153^\circ.2$ E	Feb. 13th	21h30m	Eruption.
$\varphi = 48^\circ.1$ N			
Komaga-take			
$\lambda = 140^\circ.6$ E	May 28th	at night	Ashes fell in the neighbourhood of Mori-mati, Tosima, Hokkaido.
$\varphi = 42^\circ.6$ E			
Aso			
$\lambda = 131^\circ.1$ E	June 12th		Small Eruption.
$\varphi = 32^\circ.8$ N	Sept. 6th	8h40m	Small Eruption.
	Oct. 11th	—	Black smokes were emitted all day long. Ashes fell in the Village Mori.

MAP OF JAPAN
SHOWING THE
METEOROLOGICAL AND SEISMOLOGICAL STATIONS.



DISTRIBUTION OF EPICENTRES OF REMARKABLE AND MODERATE EARTHQUAKES IN THE YEAR 1928.



Epicentres of Remarkable Earthquakes

Epicentres of Moderate Earthquakes

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