Notes on the Earthquake Investigation Committee Catalogue of Japanese Earthquakes.

By

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I. INTRODUCTION.

1. The *Earthquake Investigation Committee Catalogue of Japanese Earthquakes*[1] includes the records of 1898 earthquakes, which took place in Japan[2] during the 1451 years between the 5th year of Inkio Tenno (416 A.D.) and the 3rd year of Kei-o (1867 A. D.), each great earthquake and its after-shocks being counted in it as one. As the development of seismic literature depends much on the state of civilization of the times, the majority of old earthquake records relate naturally to Kyoto, which was the capital between 797 and 1867, A.D. Many earthquakes were also recorded in Kamakura and then in Yedo (Tokyo), when these places were the seat of the *Shogunate*, or military regency.

2. The number of earthquakes described in original histories and manuscripts as *great earthquakes* or *great shakings of the ground* amounts to 449. All of these earthquakes, however, were not destructive, some being nothing more than shocks, in which

1) Complied under the superintendence of the late Prof. Sekiya. This volume, pp. 315-388.
2) Liu-kiu Islands and Formosa excluded.

the ground moved more or less sharply without producing any damage. For the sake of making the Catalogue more definite I have classified the earthquakes contained in it into the following three kinds, according to the intensity of their motion:

Great or destructive earthquakes, in which the ground was cracked, buildings greatly damaged, lives lost, etc.;

Strong earthquakes, in which the motion was sufficiently sharp to cause people to run out of doors and to produce slight damage, such as the overthrowing of furnitures, small cracks in walls and *ishigaki* (masonry walls), embankments, etc.;

Small or slight earthquakes, in which the motion was weak and which caused neither alarm nor damage.

It may here be remarked that the relation between the absolute intensity of the earthquake motion and the amount of damage produced would not necessarily be the same in different countries. Thus, the houses in Japan are mostly constructed of wood and resist earthquake shocks much better than buildings in European cities which are often high and constructed of stone or brick, generally without any precautions being taken against earthquakes. An earthquake classed as *strong* in the Catalogue, might therefore have produced considerable damage, had it affected an European city.

II. Number of Destructive Earthquakes in Japan.

3. It is no easy matter to classify earthquakes accurately according to the scale in § 2, since some of the old earthquake records are too simple and make no reference to the intensity of motion or to the area of disturbance. In recognising which

were destructive among the earthquakes in Japan recorded in the original histories and journals, I have been guided by the following considerations:

(*a*) A shock whose destructive characters are clearly described, may be considered as a *destructive earthquake*;

(*b*) A shock in Kyoto, Kamakura or Yedo (Tokyo), which is recorded simply as a *great earthquake*, but whose destructive effects are not specially mentioned, was presumably a *strong earthquake*;

(*c*) A shock recorded, as a *great earthquake*, whose area of disturbance was very extensive or whose after-shocks were numerous, may be presumed as a *destructive earthquake* even when there exists no special description of the destructive effects;

(*d*) A shock in a remote province, which is recorded as a *great earthquake*, may generally have been a *destructive earthquake*, even when there exists no special description of the destructive effects.

4. The total number of destructive earthquakes in Japan estimated on these principles and counting to the end of the year 1898, is two hundred and twenty-two, whose dates and districts are given in Table I. I will note here that the date of destructive shocks in Liu-kiu Islands and the provinces of Tsushima and Kaga, whose original records are not yet in the hands of the Earthquake Investigation Committee, have provisionally been taken from the late Mr. H. Okajima's "Nippon Saiishi" or *A History of Unusual Events in Japan*. Again a few records relating to Hokkaido have been taken from "Hokkaido-shi" or *History and Geography of Hokkaido*.

1) Formosa excepted.

TABLE I.

DESTRUCTIVE EARTHQUAKES IN JAPAN.[1]

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
1	416	8	23	Inkio-Tenno.	5	7	14	Kawachi.
2	599	5	28	Suiko-Tenno.	7	4	27	Yamato.
3	678	1		Tenmu-Tenno.	6	12		Chikushi.
4	684	11	29	,,	12	10	14	Iyo, Tosa, Awa (in Shikoku), Kii, Yamato, Ise, Shima, Mikawa, Totomi, Suruga and Izu.
5	701	5	12	Taiho.	1	3	26	Tanba.
6	715	7	4	Reiki.	1	5	25	Totomi.
7	,,	,,	5	,,	,,	5	26	Mikawa.
8	734	5	18	Tenpei.	6	4	7	Nara (in Yamato) and several provinces.
9	737	11	28	,,	9	10	23	Osumi.
10	744	6	30	,,	16	5	12	Higo.
11	745	6	5	,,	17	4	27	Mino.
12	,,	,,	9	,,	17	5	1	Settsu.
13	762	6	9	Tenpei-hoji.	6	5	9	Mino, Hida and Shinano.
14	766	7	20	Tenpei-shingo.	2	6	5	Osumi.
15	818			Konin.	9	7		Sagami, Musashi, Shimosa, Hitachi, Kotsuke and Shimotsuke.
16	827	8	11	Tencho.	4	7	12	Kyoto.
17	830	2	3	,,	7	1	3	Akita (in Ugo).
18	841	3	13	Showa.	8	2	13	Shinano.
19	,,	7	30	,,	,,	7	5	Izu.
20	850	11	27	Kasho.	3	10	16	Dewa.
21	856	4		Saiko.	3	3		Kyoto.

1) A month in old Japanese calendar marked with an asterisk (*) is the extra or intercalary month of the same name.

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
22	863	7	10	Jokan.	5	6	17	Etchu and Echigo.
23	864	8	26	,,	6	7	17	Fuji-san erupted and its vicinity shaken.
24	867	6	21	,,	9	5	12	Aso-san erupted and its vicinity shaken.
25	868	8	3	,,	10	7	8	Kyoto, Harima, Tanba and Settsu.
26	869	7	13	,,	11	5	26	Mutsu.
27	878	11	1	Genkei.	2	9	29	Kanto provinces, especially Musashi and Sagami.
28	880	11	23	,,	4	10	14	Izumo; strongly felt in Kyoto.
29	881	1	13	,,	4	12	6	Kyoto.
30	887	8	26	Ninwa.	3	7	30	Kyoto and several provinces, especially Settsu and Shinano.
31	934	7	16	Shohei.	4	5	27	Kyoto.
32	938	5	22	Tengyo.	1	4	15	Kyoto, Yamashiro and Yamato.
33	976	7	22	Teigen.	1	6	18	Kyoto.
34	1041	8	25	Chokiu.	2	7	20	,,
35	1070	12	1	Yenkiu.	2	10	20	Kyoto, Nara, and several provinces.
36	1091	9	28	Kanji.	5	8	7	Kyoto.
37	1096	12	17	Yeicho.	1	11	24	,,
38	1137	8	10	Hoyen.	3	7	15	,,
39	1177	11	26	Jisho.	1	10	27	Nara; strongly felt in Kyoto.
40	1180	12	21	,,	4	11	26	Kii.
41	1185	8	13	Bunji.	1	7	9	Kyoto.
42	1186	10	3	,,	2	8	12	,,
43	1213	6	18	Kenpo.	1	5	21	Kamakura.
44	1215	10	7	,,	3	9	6	,,
45	1227	4	1	Antei.	1	3	7	,,
46	,,	12	22	,,	,,	11	6	,,
47	1235	4	5	Katei.	1	3	9	,,
48	1241	3	27	Ninji.	2	2	7	,,

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
49	1241	5	22	Ninji.	2	4	3	Kamakura.
50	1245	8	26	Kangen.	3	7	26	Kyoto.
51	1250	8	24	Kencho.	2	7	18	Kamakura.
52	1257			Shoka.	1	Spring.		Tsushima.
53	,,	10	9	,,	,,	8	23	Kamakura.
54	1273	4	5	Bunyei.	10	3	9	Aizu (in Iwashiro).
55	1293	5	27	Yeinin.	1	4	13	Kamakura and Kanto provinces.
56	1325	12	5	Seichu.	2	10	21	Kinai provinces; strongly felt in Kyoto.
57	1331	8	15	Genko.	1	7	3	Kii and several other provinces.
58	,,	,,	19	,,	,,	7	7	Suruga.
59	1350	7	6	Shohei.	5	5	23	Kyoto.
60	1361	8	1	,,	16	6	22	Kii, Yamato, Kawachi, Izumi and Settsu; strongly felt in Kyoto.
61	,,	,,	3	,,	,,	,,	24	Yamato, Kawachi, Settsu, Izumi, Awaji, Kii and Awa (in Shikoku).
62	1375	5	23	Tenju.	1	4	14	Aizu (in Iwashiro).
63	1388	2	5	Genchu.	4	12	19	,,
64	1400	11	19	O-yei.	7	10	24	Kyoto, Ise and Iga.
65	1407	2	21	,,	14	1	5	Aizu (in Iwashiro) and several provinces; strongly felt in Kyoto.
66	1408	1	27	,,	,,	12	14	Settsu; slightly felt in Kyoto.
67	,,	11	26	,,	15	10	29	Kyoto.
68	1420	9	26	,,	27	8	10	Kamakura (in Sagami).
69	1425	11	23	,,	32	11	5	Kyoto.
70	1433	2	23	Yeikyo.	5	1	24	Ise and Omi; strongly felt in Kyoto.
71	,,	11	7	,,	,,	9	16	Shimosa, Sagami, Kai and Aizu (in Iwashiro); strongly felt in Kyoto.
72	1436	8	30	,,	8	7	9	Aizu (in Iwashiro).
73	1440	10	22	,,	12	9	18	Aizu; strongly felt in Kyoto.

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
74	1442	12	1	Kakitsu.	2	10	20	Kozuke.
75	1445	1	9	Bun-an.	1	11	22	Kyoto.
76	1448			,,	5			Several provinces.
77	1449	5	13	Hotoku.	1	4	12	Kyoto, Yamashiro and Yamato.
78	1454	12	21	Kyotoku.	3	11	23	Kozuke.
79	1466	5	29	Bunsho.	1	4	6	Yamashiro and Yamato.
80	1474			Bunmei.	6	Winter.		(District not known).
81	1475	5	29	,,	7	4	16	Aizu (in Iwashiro).
82	1479	9	27	,,	11	9	3	,,
83	1489	5	29	Yentoku.	1	4	20	,,
84	1492	7	19	Mei-o.	1	6	16	,,
85	1494	2	21	,,	3	1	7	,,
86	,,	6	19	,,	,,	5	7	Nara; strongly felt in Kyoto.
87	1498	7	9	,,	7	6	11	Several provinces; strongly felt in Kyoto.
88	,,	9	20		7	8	25	Kii, Yamato, Iga, Ise, Owari, Mikawa, Totomi, Suruga, Kai, Izu, Sagami, Musashi, Awa, Kazusa, Shimosa, Shimotsuke, Hitachi and Iwashiro; strongly felt in Kyoto.
89	1500	7	10	,,	9	6	4	Kai.
90	1502	1	28	Bunki.	1	12	10	Echigo.
91	1507	3	31	Yeisho.	4	2	8	Higo; strongly felt in Kyoto.
92	1510	9	21	,,	7	8	8	Settsu and Kawachi; strongly felt in Kyoto.
93	,,	10	10	,,	,,	8	27	Totomi.
94	1511	9	9	,,	8	8	7	Hitachi.
95	1512	3	6	,,	9	2	8	Strongly felt in Kyoto, probably a great earthquake in the vicinity.
96	,,	7	31	,,	,,	6	9	Yamashiro and probably also other provinces.
97	1516	8	20	,,	13	7	12	Kai.

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
98	1517	7	18	Yeisho.	14	6	20	Aizu (in Iwashiro).
99	1525	9	20	Taiyei.	5	8	23	Kamakura and Aizu (in Iwashiro).
100	1532	3	6	Tenmon.	1	1	20	Sanuki.
101	1544	5	23	,,	13	4	22	Satsuma.
102	1545			,,	14	3		,,
103	1549	5	21	,,	18	4	14	Kai.
104	1553	10	11	,,	22	8	24	Kamakura.
105	1555	9	14	Koji.	1	8	19	Aizu (in Iwashiro).
106	1563	2	28	Yeiroku.	6	1	26	Hitachi, Iwaki, Shimotsuke and Aizu (in Iwashiro).
107	,,	12	27	,,	,,	12	2	Musashi, Shimotsuke, Hitachi, Iwaki and Aizu (in Iwashiro).
108	1578	12	8	Tensho.	6	10	29	Mikawa.
109	1585	7	31	,,	13	7	5	,,
110	1586	1	15	,,	,,	11	26	Kaga.
111	,,	,,	18	,,	,,	,,	29	Sanuki, Awaji, Wakasa, Echizen, Kaga, Hida, Yamashiro, Yamato, Kawachi, Izumi, Settsu, Omi, Mino, Iga, Ise, Mikawa and Omari.
112	1589	3	21	,,	17	2	5	Suruga and Totomi.
113	1596	9	1	Keicho.	1	7*	9	Kyoto and Satsuma.
114	,,	,,	4	,,	,,	,,	12	Kyoto and Kinai provinces, Kii, Chikuzen, and several other provinces.
115	1600	7	23	,,	5	6	13	Tsugaru (in Mutsu), the Iwakisan erupted.
116	1605	1	31	,,	9	12	16	Kii, Ise, Shima, Owari, Mikawa, Totomi, Suruga, Izu, Awa, Kazusa, Shimosa, Hachijo-shima, and provinces in Kiushiu and Shikoku.
117	1611	9	27	,,	16	8	21	Aizu (in Iwashiro).
118	,,	12	2	,,	,,	10	28	Sendai (in Rikuzen) and Yezo.

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
119	1614	11	26	Keicho.	19	10	25	Takata (in Echigo); strongly felt in Kyoto and at Odawara (in Sagami).
120	1615	6	26	Genwa.	1	6	1	Yedo.
121	1616	9	9	,,	2	7	28	Sendai (in Rikuzen).
122	1624	6	19	Kan-yei.	1	5	4	Shimotsuke.
123	1628	8	10	,,	5	7	11	Yedo.
124	1630	8	1	,,	7	6	23	,,
125	1633	3	1	,,	10	1	21	Odawara (in Sagami) and Kanto.
126	1635	3	10	,,	12	1	21	Mutsumaye (in Oshima).
127	,,	,,	12	,,	,,	,,	23	Yedo.
128	1639	11		,,	16	11		Echizen.
129	1644	3		Shoho.	1	3		Nikko (in Shimotsuke).
130	,,	10	18	,,	,,	9	18	Honjo (in Ugo).
131	1646	6	9	,,	3	4	26	Sendai, Mutsu and Dewa.
132	1647	6	16	,,	4	5	14	Yedo and Sagami.
133	1648	6	12	Kei-an.	1	4	22	Sagami; strongly felt in Yedo.
134	1649	3	17	,,	2	2	5	Aki and Iyo (slightly felt in Kyoto).
135	,,	7	30	,,	,,	6	21	Yedo and Nikko (in Shimotsuke).
136	,,	9	1	,,	,,	7	25	Yedo.
137	1659	4	21	Manji.	2	2	30	Shimotsuke, Iwaki and Iwashiro; strongly felt in Yedo.
138	1661	12	10	Kanbun.	1	10	19	Tosa.
139	1662	5	12	,,	2	3	24	Kyoto, Yamashiro, Kawachi and Settsu; strongly felt in Yedo.
140	,,	6	16	,,	2	5	1	Kyoto, Yamashiro, Yamato, Kawachi, Izumi, Settsu, Wakasa, Tanba, Iga, Ise, Owari, Mikawa, Omi, Mino, Shinano and Hizen.

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
141	1662	10	30	Kanbun.	2	9	19	Hiuga and Osumi.
142	1663	8	17	,,	3	7	15	Oshima and Iburi, the Usu-dake erupted.
143	1664	1	4	,,	,,	12	6	Kyoto and Yamashiro.
144	,,	8	3	,,	4	6	12	Kii.
145	,,			,,	,,			Liu-kiu.
146	1665	6	25	,,	5	5	12	Kyoto.
147	1666	2	1	,,	,,	12	27	Takata (in Echigo).
148	1668	8	28	,,	8	7	21	Sendai (in Rikuzen).
149	1670	7	21	,,	10	6	5	Osumi (in Sagami).
150	,,	9	28	,,	,,	8	15	Tsushima.
151	1676	7	12	Yenpo.	4	6	2	Tsuwano (in Iwami).
152	1677	4	13	,,	5	3	12	Tsugaru (in Rikuoku).
153	1683	6	18	Tenwa.	3	5	24	Nikko (in Shimotsuke); strongly felt in Yedo.
154	,,	10	20	,,	,,	9	1	Nikko.
155	1685	10	8	Teikyo.	2	9	11	Suwo and Nagato; strongly felt in Kyoto.
156	1686	10	3	,,	3	8	16	Totomi and Mikawa; slightly felt in Kyoto.
157	1694	6	19	Genroku.	7	5	27	Shonai (in Uzen), and Akita and Noshiro (in Ugo).
158	1697	11	25	,,	10	10	12	Sagami, especially Kamakura; strongly felt in Yedo.
159	1699	9	23	,,	12	9	1	Kii.
160	1700	4	16	,,	13	2	27	Tsushima.
161	1703	12	31	,,	16	11	23	Yedo, Musashi, Sagami, Kai, Awa, Kazusa, Shimosa, Suruga, Izu, Hitachi and Iwaki.
162	1706			Hoyei.	3			Miyako-shima (Liu-kiu).
163	1707	10	28	,,	4	10	4	Hiuga, Bungo, Sanuki, Iyo, Tosa, Awa (in Shikoku), Awaji, Harima, Kii, Yamashiro, Yamato, Kawachi Settsu, Izumi, Omi, Mino, Shinano, Ise, Shima, Owari, Mikawa, Totomi, Suruga, Izu, Sagami, Kai, and other provinces in Kiushiu and Sanyodo; strongly felt in Yedo.

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
164	1707	12	16	Hoyei.	4	11	23	Suruga and Totomi, the Fujisan erupted.
165	1709	3	11	,,	8	2	1	Mimasaka, Inaba and Hoki; slightly felt in Kyoto.
166	1714	4	28	Shotoku.	4	3	15	Shinano.
167	1718	8	22	Kyoho.	3	7	26	Yamashiro, Shinano, Totomi and Mikawa; strongly felt in Kyoto.
168	1723	12	17	,,	8	11	20	Saikaido provinces.
169	1725	10	30	,,	10	9	25	Nagasaki.
170	1729	8	1	,,	14	7	7	Noto and Sado.
171	1730	3	12	,,	15	1	24	Tsushima.
172	1731	10	7	,,	16	9	7	Ko-ori (in Iwashiro).
173	1751	5	20	Horeki.	1	4	25	Takata (in Echigo).
174	1762	10	31	,,	12	9	15	Sado.
175	1766	3	8	Meiwa.	3	1	28	Mutsu and Oshima.
176	1769	8	29	,,	6	7	28	Sadowara (in Hiuga).
177	1778	2	14	Anyei.	7	1	18	Aki, Bizen, Bitchu and Bingo.
178	1780	5		,,	9	4		Urup Island (Chishima).
179	1782	8	23	Tenmei.	2	7	15	Yedo and Sagami.
180	1792	4	21	Kansei.	4	3	1	Hizen, the Unsen-dake erupted.
181	1798	7	8	,,	10	5	25	Kaga.
182	1802	12	9	Kyowa.	2	11	15	Sado.
183	1804	7	13	Bunka.	1	6	7	Shonai (in Uzen).
184	1810	2	4	,,	7	1	1	Sado.
185	1812	12	7	,,	9	11	4	Yedo and neighbouring provinces.
186	1815	3	2	,,	12	1	22	Kaga.
187	1819	8	2	Bunsei.	2	6	12	Yamashiro, Yamato, Kawachi, Settsu, Omi, Mino, Iga and Ise.
188	1821	12	13	,,	4	11	19	Onuma-gun (in Iwashiro).
189	1822	3	12	,,	5	1*	19	Yezo; the Usu-dake erupted.

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
190	1828	12	18	Bunsei.	11	11	12	Sanjo, Mitsuke, Nagaoka, Yoita and Wakino (all in Echigo).
191	1830	8	19	Tenpo.	1	7	2	Kyoto, Yamashiro, Wakasa, Tanba and Omi.
192	1831	11	13	,,	2	10	10	Hizen.
193	1833	12	7	,,	4	10	26	Sado.
194	1834	2	9	,,	5	1	1	Ishikari.
195	1835	8	19	,,	6	7	25	Rikuzen, Rikuchiu, Mutsu and Nemuro.
196	1841	5		,,	12	4		Suruga.
197	1843	4	25	,,	14	3	26	Kushiro and Nemuro.
198	1844	5	11	Koka.	4	3	24	Shinano and Echigo.
199	1853	3	11	Ka yei.	6	2	2	Odawara, Sagami, Suruga, Izu, Totomi and Mikawa.
200	1854	7	9	Ansei.	1	6	15	Echigo, Tanba, Harima, Yamashiro, Yamato, Kawachi, Izumi, Settsu, Echizen, Omi, Mino, Iga, Ise, Owari, Mikawa and Kii.
201	,,	12	23	,,	1	11	4	Buzen, Bungo, Hizen, Higo, Chikuzen, Chikugo, Hiuga, Osumi, Satsuma, Harima, Bizen, Bitchiu, Bingo, Aki, Suwo, Nagato, Echigo, Izumo, Iwami, Wakasa, Echizen, Kii, Awaji, Awa (in Shikoku), Sanuki, Iyo, Tosa, Yamashiro, Yamato, Kawachi, Izumi, Settsu, Omi, Shinano, Mino, Iga, Ise, Shima, Owari, Mikawa, Totomi, Suruga, Kai, Izu, Sagami, Musashi and Shimotsuke.
202	1855	11	11	,,	2	10	2	Yedo, Musashi, Sagami and Shimosa.
203	1856	8	23	,,	3	7	23	Hakodate (in Oshima) and Yufutsu (in Iburi).
204	1857	6	14	,,	4	5*	23	Suruga.
205	,,	10	15	,,	4	8	28	Iyo.
206	1858	4	9	,,	5	2	26	Echizen and Etchiu.

No.	European Date.			Japanese Date.				District.
	Year	Month	Day	Period	Year	Month	Day	
207	1858	4	23	Ansei.	5	3	10	Shinano.
208	1872	3	14	Meiji.	5	2	6	Iwami.
209	1874	2	28	,,	7	2	28	Teshiwo.
210	1881	10		,,	14	10		Kunashiri Island (Chishima).
211	1889	7	28	,,	22	7	28	Kumamoto.
212	1891	10	28	,,	24	10	28	Mino, Owari, Echizen, Mikawa, Settsu, Yamashiro, Yamato, Kawachi, Ise, Omi, Shinano and Totomi.
213	1892	12	9	,,	25	12	9	Noto.
214	1893	9	7	,,	26	9	7	Kagoshima (in Satsuma).
215	1894	3	22	,,	27	3	22	Nemuro, Kushiro and Kunashiri Island.
216	,,	6	20	,,	27	6	20	Tokyo and vicinity.
217	,,	10	22	,,	27	10	22	Shonai (in Uzen).
218	1896	6	15	,,	29	6	15	Great sea-waves along the eastern coast of the north Japan.
219	,,	8	31	,,	,,	8	31	Ugo and Rikuchiu.
220	1897	1	17	,,	30	1	17	Nagano (in Shinano).
221	,,	2	20	,,	,,	2	20	Sendai and eastern part of Rikuzen.
222	1898	8	10	,,	31	8	10	Chikuzen.

TABLE II.

Number of Destructive Earthquakes in Japan.

Century.	Number of destructive earthquakes.	Century.	Number of destructive earthquakes.
V	1	XIII	13
VI	1	XIV	8
VII	2	XV	25
VIII	10	XVI	26
IX	16	XVII	45
X	3	XVIII	22
XI	4	XIX	41
XII	5	Sum	222

5. From Table II it will be seen that the numbers of destructive earthquakes in the 5th, 6th, and 7th centuries are very few. This circumstance may of course be due to the imperfection of historical records in those early times, it being only from the end of the 7th century that the records begin to augment. Taking as starting point December, 678 A.D., when the first of the two destructive earthquakes in the 7th century took place, we have 220 such earthquakes in Japan[1] in the interval of 1220 years down to the end of 1898, there being on the average one destructive earthquake in every 5 years and 7 months. As, however, the earthquake records in old times, which relate to remote provinces, would naturally be imperfect, the above average interval between two successive destructive shocks is without doubt somewhat longer than what was actually the case. On

1) Formosa excepted.

the other hand, in the epoch of the Tokugawa Shogunate which began from the commencement of the 17th century, the records of destructive earthquakes must, except for Hokkaido and Liu-kiu Islands, be very nearly perfect, as it was the rule of the Government to let each feudal chief send in a detailed report of the damage caused in his dominion by an earthquake or other natural events. The earliest recorded earthquake in Hokkaido happened on the 2nd December, 1611, and that in Liu-kiu Islands first in 1664.

In the interval of 299 years from the begining of the 17th century to the end of the year 1898 there were in Japan[1] one hundred and eight destructive earthquakes, of which eleven happened in Hokkaido, and two in Liu-kiu Islands. The mean interval of time between two successive destructive earthquakes in this epoch was, therefore, for the whole of Japan,[1] 2 years and 9 months, or, excluding Hokkaido and Liu-kiu Islands, 3 years and 2 months.

From the above we may conclude that one part or other of Japan[1] is likely to be visited by a destructive earthquake once in nearly every $2\frac{1}{2}$ years on the average.

III. Annual Variation of the Frequency of Destructive Earthquakes.

6. The relation of destructive earthquakes to time may be considered under two heads: their distribution through the year, and their distribution in historic times, of which the former or the annual variation of the frequency of destructive earthquakes in Japan will be taken first.

1) Formosa excepted.

Tables III, IV and V respectively show the monthly, seasonal and half-yearly distribution of all the destructive earthquakes contained in Table I, except six whose exact dates are not recorded.

TABLE III.

Monthly Distribution of 216 Destructive Earthquakes in Japan.

Month.	Number of earthquakes.
I	10
II	13
III	18
IV	12
V	18
VI	19
VII	23
VIII	32
IX	16
X	19
XI	14
XII	22

TABLE IV.

Seasonal Distribution of 216 Destructive Earthquakes in Japan.

Season.		Number of earthquakes.
Spring	March. April. May.	48
Summer	June. July. August.	74
Autumn	September. October. November.	49
Winter	December. January. February.	45

TABLE V.

Semi-annual Distribution of 216 Destructive Earthquakes in Japan.

Division of the year.		Number of earthquakes.
Warmer months	April, May, June, July, August, September.	120
Colder months	October, November, December, January, February, March.	96

According to Table III, the maximum monthly number of 32 occurred in August and the minimum of 10 in January, the ratio of these two numbers being as 3.2 : 1.

According to Table IV, the maximum seasonal number of 74 occurred in Summer, and the minimum of 45 in Winter, the ratio of these two numbers being as 1.6:1. The numbers for Spring, Autumn and Winter, do not, however, differ much among themselves.

Further, according to Table V, the earthquake number in the warmer months of the year was greater in the ratio of 1.3 :1 than that in the colder months.

The results contained in Tables III and IV are illustrated respectively in figs. 1 and 3, the curves being drawn, not always through representation points themselves, but by free-hand through the positions of the arithmetical means of two successive points. The same method of curve-drawing has been employed in all the other similar figures.

7. For the sake of comparing the annual variation of the frequency of destructive earthquakes with that of ordinary small ones, or those which are not the after-shocks of great earthquakes, I give in Table VI the monthly numbers of earthquakes observed in whole of Japan[1] during ten years between 1885 and 1894.

The enormous rise in earthquake numbers after November 1891 is due to the occurrence of the Mino-Owari earthquake on the 28th October, 1891, of the Kagoshima earthquake on the 7th September, 1893, of the Hokkaido earthquake on the 20th March, 1894, and several other strong earthquakes, each of which was followed by a great number of after-shocks. Hence,

1) Formosa and Liu-kiu Islands excepted.

only the earthquake numbers for the months between January, 1885, and October,[1] 1891, have been utilised in deducing the mean monthly earthquake frequencies given at the bottom of the Table, which are intended to represent the approximate state of seismic activity in *ordinary* times, namely, in those years free from destructive earthquakes and their after-shocks, the numbers for the six months, from July to December, 1889, having also been left out of account, in order to exclude the greater portion of the after-shocks of the Kumamoto earthquake of the 28th July, 1889.

In Tables VII and VIII are given respectively the seasonal and the semi-annual distribution of *ordinary* or non-destructive earthquakes deduced from Table VI.

TABLE VI.

Monthly Number of Earthquakes in Japan,[2] during 10 years, 1885-1894.

Year \ Month	I	II	III	IV	V	VI	VII	VIII	IX	X	XI	XII	Sum
1885	32	44	37	37	51	46	32	30	45	41	47	40	482
1886	38	39	49	38	58	30	36	46	41	33	22	42	472
1887	41	58	30	29	60	38	38	35	43	20	35	56	483
1888	53	77	46	42	69	40	40	34	42	47	85	55	630
1889	53	57	63	67	60	39	65	192	79	103	82	70	930
1880	86	65	83	80	93	66	59	55	48	63	98	49	845
1891	34	70	64	83	66	59	57	72	31	98	1412	624	2670
1892	411	203	148	162	137	93	111	116	163	123	119	132	1918
1893	118	90	128	109	115	156	102	77	297	136	102	106	1536
1894	415	182	570	244	144	170	121	250	154	189	150	140	2729
Mean.	48.1	58.6	53.1	53.7	65.3	45.4	43.7	45.3	41.7	50.3	57.4	48.4	

1) The earthquake number for October 1891 does not include the after shocks of the Mino-Owari Earthquake of the 28th of the same month.

2) Formosa and Liu-kiu Islands excepted.

TABLE VII.

Mean Seasonal Distribution of Earthquakes in Japan.[1]

Season.	Spring (March. April. May.)	Summer (June. July. August.)	Autumn (September. October. November.)	Winter (December. January. February.)
Number of eqkes.	172	134	149	155

TABLE VIII.

Mean Semi-Annual Distribution of Earthquakes in Japan.[1]

Division of the year.	Warmer Months. (April, May, June, July, August, September.)	Colder Months. (October, November, December, January, February, March.)
Number of eqkes.	295	316

According to Table VI, the greatest monthly number 65.3 occurred in May, and the smallest numbers, varying between 41.7 and 45.4, in the months of June, July, August and September, the ratio of the maximum to the minimum being as 1.6:1. According to Table VII, the maximum seasonal number

1) Based on the earthquake numbers given in Table VI for the months between anuary 1885 and October 1891.

of 172 occurred in Spring, and the minimum of 134 in Summer, the ratio of the two numbers being as 1.3:1. Finally, according to Table VIII, the number of earthquakes in the warmer months of the year was greater in the ratio of 1.1:1 than that in the colder months. The results contained in Tables VI and VII are illustrated in figs. 2 and 4.

8. Comparing figs. 1 and 3 with figs. 2 and 4, the annual variation of the frequency of *ordinary* small shocks, whose minimum occurs in the months of June, July, August and September, will be observed to be just the reverse of that of destructive earthquakes, whose maximum occurs in the months of July and August.[1]

To explain this fact, we may remark that the geotechtonic disturbances, which caused the destructive earthquakes given in Table I, were most probably greater than those of the majority of the ordinary earthquakes included in Table VI. Now, as an earthquake implies the removal of a weak point in the earth's crust, and the consequent settling of the latter to a stable equilibrium, the constant occurrence of small earthquakes is, for unstable countries like Japan, to be regarded as maintaining the region concerned in a normal or safe condition, thereby preventing any abnormal accumulation of stress in the earth's crust. Their non-occurrence, or an unusually low seismic frequency may, on the other hand, cause an accumulation of stress in the earth's crust, thereby facilitating the occurrence of great or destructive seismic disturbances.

1. Dr. C. Davison found from Mallet's Catalogue a similar reversal of the maximum epoch in the annual variation of *destructive* and *slight* earthquakes. See Trans. Roy. Soc. Lond., Vol. 184 (1893), p. 1116.

IV. Distribution of Destructive Earthquakes in Historic Times of Japan.[1]

9. The distribution in time of the destructive earthquakes in Japan[1] from the 8th century to the present time is graphically shown in fig. 5, from which it will be observed that the distribution was not uniform, but was rather in groups.

10. The epochs of the minimum frequency of destructive earthquakes selected from the epoch of the Tokugawa Shogunate, which dates from the beginning of the 17th century, were as follows:—in the interval of 31 years between the earthquake at Ko-ori (in Iwashiro) of the 7th October, 1731, and the earthquake in Sado of the 31st October, 1762, there was only the earthquake at Takata (in Echigo) of the 20th May, 1751; and in the interval of 31 years and 3 months between the Shinano earthquake of the 23rd April, 1858, and the Kumamoto earthquake of the 28th July 1889, there was only the earthquake in Iwami of the 14th March, 1872.

11. On the other hand, the most remarkable epochs of maximum frequency of destructive earthquakes were as follows: in the interval of 5 years and 5 months between March, 1644, and the 3rd August, 1649, there were nine destructive earthquakes, giving as average one in every 8 months; in the interval of 11 years and 5 months between the 21st April, 1659, and the 28th September, 1670, there were twelve destructive earthquakes, giving as average one in 12½ months; in the interval of 5 years and 1 month between the 11th March, 1853, and the 23rd April, 1858, there were eight destructive earthquakes, which give one to every 9 months; and, finally, in the interval of 9 years, bet-

1) Formosa, Liu-kiu Islands and Hokkaido excepted.

ween the 28th July, 1889, and the 10th August, 1898, there were eleven destructive earthquakes, giving as average one in every 10 months.

12. If we count, instead of the actual number of destructive earthquakes, the number of years in which one or more occurred, we find 78 instances in the interval of 299 years from the beginning of the 17th century to the present time; the maximum number of destructive earthquakes in one year, namely three, having occurred in 1649 and 1662. In other words, 26 years in every 100 were each visited, on the average, by one, two, or three destructive earthquakes, the other 74 years remaining free from such seismic disturbances.

13. From fig. 5 it will be seen that destructive earthquakes happen sometimes singly or isolated, but tend to occur in groups in epochs of maximum frequency.

As a trial, I have in Table IX divided the 154 destructive earthquakes since the beginning of the 14th century into 41 groups, whose longest duration was 15 years, the maximum earthquake number included in one group being 12.

TABLE IX.

Time Distribution of Destructive Earthquakes in Japan.[1]

(From the 14th century to the present time).

Time interval.	Number of destructive eqkes.	Mean epoch.	Difference
yr. month yr. month		yr. month	yrs.
1325.12-1331. 8	3	1329. 9	21.
1350. 7	1	1350. 7	11.
1361. 6	2	1361. 8	14.
1375. 5	1	1375. 5	13.
1388. 2	1	1388. 2	13.
1400. 9	1	1400. 9	7.
1407. 2-1408.11	3	1408. 1	15.
1420. 9-1425.11	2	1423. 4	19.
1433. 2-1454.12	9	1442. 9	24.
1466. 5	1	1466. 5	10.
1474. -1479. 9	3	1476. 5	20.
1489. 5-1502. 1	9	1496. 3	16.
1507. 4-1517. 7	8	1512. 5	13.
1525.9	1	1525. 9	7.
1532 3	1	1532. 3	17.
1544. 5-1555. 9	5	1549. 8	14.
1563. 2-1563.12	2	1563. 7	15.
1578.12	1	1578.12	8.
1585. 7-1589. 3	4	1586. 9	13.
1596. 9-1605. 2	4	1599. 9	15.
1611. 9-1616. 9	4	1614. 9	

Time interval.	Number of destructive eqkes.	Mean epoch.	Difference.
yr. month yr. month		yr. month	yrs.
1624. 6-1639.11	6	1632. 0	17.
1644. 3-1649. 8	9	1647. 9	16.
1659. 4-1670. 7	12	1664.11	17.
1676. 7-1677. 4	2	1677. 0	12.
1683. 6-1686.10	4	1685. 0	8.
1694. 6-1709. 3	8	1702. 8	18.
1714. 4-1718. 8	2	1716. 6	14.
1723.12-1731.10	5	1728. 3	12.
1751. 5	1	1751. 5	23.
1762.10-1769. 8	3	1766. 3	15.
1778. 2-1782. 8	2	1780. 5	14.
1792. 4	1	1792. 4	12.
1798. 7-1804. 7	3	1802. 1	10.
1810. 2-1815. 3	2	1812.10	11.
1819. 8-1821.12	2	1820.10	8.
1828.12-1835. 8	5	1832. 3	11.
1841. 5-1844. 5	1	1842.11	11.
1853. 3-1858. 4	8	1856. 5	14.
1872. 3	1	1892. 3	16.
1889. 7-1898. 8	11	1894.10	23.
Mean.....			$13\frac{1}{3}$

1) Formosa, Liu-kiu Islands and Hokkaido excepted.

The *mean epochs* given in the third column of Table IX, each of which indicates the mean of the dates of those earthquakes included in one group, may be interpreted as representing the epochs of greatest activity of destructive shocks. Again, the *differences* given in the fourth column of the same table, which are the intervals between the successive *mean epochs*, vary between 7 and 23 years, the average value being $13\frac{1}{3}$ years. The conclusion is that the epochs of maximum activity of destructive shocks would recur on the average in every 13 or 14 years.

14. It is impossible to determine whether there was in historic times a permanent variation in the frequency of destructive earthquakes in Japan as a whole; the increase of earthquake records in later centuries implying, of course, not necessarily any such variation. The frequency seems, however, to be subject to certain fluctuations of long period. Thus the curve in fig. 6, which represents the variation of the 10-yearly activity of destructive earthquakes in Japan, indicates a maximum in the middle of the 17th century, and one minimum in the middle of the 16th and another in the middle of the 18th century, the length of the period being in this case about 200 years. Again, according to fig. 7, which shows for the whole country the variation of the activity of destructive earthquakes in every half century, since the latter half of the 6th century (see Table XII), there seems to exist, in the interval of about 1000 years between the middle of the 8th century and that of the 18th a more or less definite series of 5 maxima and minima, giving a period of an average length of 200 years.

15. To see whether the long-period fluctuations of *ordinary* small shocks and destructive earthquakes take place simultaneously, I shall compare the curve of the half-century activity

of destructive earthquakes in Japan, fig. 7, with that of the total seismic activity for Kyoto, fig. 9. It will be observed that both curves present maxima and minima in nearly the same epochs. No similar result, however, is to be obtained when we examine the thing more in detail. Thus, the curve of the decennial activity of destructive earthquakes in Japan, fig. 6, presents a *minimum* at the middle of the 18th century, but the curve of frequency of small earthquakes at Kyoto since the 16th century, fig. 8, presents a *maximum* at the same epoch. When considered in a general way, therefore, destructive earthquakes and ordinary small shocks seem to present the maxima and minima of their frequency in nearly the same epochs; but, when examined in detail, the maxima of short-period fluctuations in the frequency of one kind of earthquakes may happen, as has been found to be the case with the annual variation, simultaneously with the minima in the frequency of the other kind of earthquakes and *vice versa*. It may be observed that these two conclusion are not contradictory to each other, the case being somewhat analogous to the relation of volcanoes and earthquakes. It is well known that a country, rich in active volcanoes, is also very frequently disturbed by earthquakes. But when we examine different parts of such a country in detail, it will be found that the immediate vicinity of an active volcano is rarely affected by destructive earthquakes.

V. Geographical Distribution of Destructive Earthquakes in Japan.

16. The geographical distribution of destructive earthquakes in Japan is given in Table X, the figures in the second and third columns giving the numbers of earthquakes which took place

in each province since the earliest times (5th century), and since the 17th century. See figs. 20 and 21.

TABLE X.

Geographical Distribution of Destructive Earthquakes in Japan.[1]

Province.	Number of destructive eqkes, from the 5th century to the present time.	Number of destructive eqkes, from the 17th century to the present time.	Average interval of time.	Province.	Number of destructive eqkes, from the 5th century to the present time.	Number of destructive eqkes, from the 17th century to the present time.	Average interval of time.
			years.				years.
Yamashiro	34	10	30	Hitachi	6	1	
Yamato	21	6	50	Omi	10	7	43
Kawachi	15	8	37	Mino	10	6	50
Izumi	9	4	75	Hida	2	0	
Settsu	16	7	43	Shinano	12	9	33
Iga	7	4	75	Kotsuke	3	0	
Ise	12	7	43	Shimotsuke	11	7	43
Shima	4	3	100	Iwaki	4	2	
Owari	8	6	50	Iwashiro	22	4	75
Mikawa	15	9	33	Rikuzen	7	7	43
Totomi	13	8	37	Rikuchiu	4	4	75
Suruga	13	8	37	Mutsu.	5	5	60
Kai	9	3	100	Uzen	3	3	100
Izu	8	5	60	Ugo	4	3	100
Sagami	28	11	27	Wakasa	4	3	100
Musashi	18	14	21	Echizen	6	5	60
Awa (in Tokaido)	3	3	100	Kaga	3	2	
Kazusa	3	3	100	Noto	2	2	
Shimosa	6	3	100	Etchiu	2	1	

1) In the seven cases at the end of the list (marked with asterisks) the districts are given in too wide and indefinite terms. These have therefore been excluded in the construction of the maps, figs. 20 and 21.

Province.	Number of destructive eqkes, from the 5th century to the present time.	Number of destructive eqkes, from the 17th century to the present time.	Average interval of time.	Province.	Number of destructive eqkes, from the 5th century to the present time.	Number of destructive eqkes, from the 17th century to the present time.	Average interval of time.
			years.				years.
Echigo	7	5	60	Hizen	5	5	60
Sado	5	5	60	Higo	5	2	
Kii	13	6	50	Hiuga	4	4	75
Awaji	4	2		Osumi	4	2	
Awa (in Shikoku.	5	3	100	Satsuma	5	2	
Sanuki	5	3	100	Iki	0	0	
Iyo	6	5	60	Tsushima	4	3	100
Tosa	5	4	75	Oshima	4	4	75
Tanba	5	3	100	Shiribeshi	0	0	
Tango	2	2		Ishikari	1	1	
Tajima	0	0		Teshiwo	1	1	
Inaba	2	2		Kitami	0	0	
Hoki	1	1		Iburi	2	2	
Izumo	2	1		Hitaka	0	0	
Iwami	3	3	100	Tokachi	0	0	
Harima	4	3	100	Kushiro	2	2	
Mimasaka	1	1		Nemuro	3	3	
Bizen	2	2		Chishima	2	2	
Bitchu	2	2		Liu-kiu	2	2	
Bingo	2	2		Kinai*	1	0	
Aki	3	3	100	Dewa*	1	0	
Suwo	1	1		Mutsu*	1	0	
Nagato	2	2		Kiushiu*	2	2	
Chikuzen	3	2		Chikushi*	1	0	
Chikugo	1	1		Yezo*	1	1	
Buzen	1	1		Several provinces.*	5	0	
Bungo	2	2					

17. *Distribution of destructive earthquakes since the earliest times.* The maximum number of 34 occurred in Yamashiro, due without doubt to that province's containing Kyoto, which was the capital from the end of the 8th century till 1867. Sagami and Musashi, for which the numbers of destructive earthquakes were respectively 28 and 18, seem really to have been the regions most disturbed in Japan, as the greatest numbers of destructive earthquakes since the 17th century occurred in these two provinces. To sum up: no destructive earthquake occurred in the seven provinces of Iki, Oki, Tajima, Shiribeshi, Kitami, Hitaka and Tokachi; only one in the seven provinces of Chikugo, Buzen, Suwo, Hoki, Mimasaka, Ishikari and Teshio; more than eleven in the fourteen provinces of Yamashiro, Yamato, Kawachi, Settsu, Kii, Ise, Shinano, Mikawa, Totomi, Suruga, Sagami, Musashi, Shimotsuke and Iwashiro; between six and ten in the thirteen provinces of Iyo, Izumi, Iga, Omi, Echizen, Mino, Owari, Kai, Izu, Shimosa, Hitachi, Echigo and Rikuzen; and between two and five in the remaining forty-two provinces.

18. With respect to the distribution of destructive earthquakes in the interval between the 17th century and the present time, the maximum number of 14 occurred in Musashi, and the next greatest number, that of 11, in Sagami. Between six and ten destructive earthquakes occurred in the sixteen provinces of Yamashiro, Yamato, Kawachi, Settsu, Kii, Iga, Ise, Omi, Mino, Owari, Mikawa, Totomi, Suruga, Shinano, Shimotsuke and Rikuzen; only one in the ten provinces of Chikugo, Buzen, Suwo, Izumo, Hoki, Mimasaka, Etchiu, Hitachi, Ishikari and Teshio; none in the nine provinces of Iki, Oki, Tajima,

Hida, Kotsuke, Shiribeshi, Hitaka, Tokachi and Kitami; and between two and five occurred in the remaining forty-six provinces.

19. *The area of earthquake disturbance.* Let us for the sake of convenience distinguish destructive earthquakes, according to the magnitude of the area of disturbance, into two kinds, namely, *local* earthquakes, in which the area of destructive motion was confined to only one province, and *non-local* earthquakes, in which the area extended over several provinces. According to this convention, the 222 destructive earthquakes contained in Table I may be divided into 149 local and 73 non-local ones, the ratio of these two numbers being as 2:1. Further, from examination of Table I, it will be seen that the provinces of Osumi, Satsuma, Higo, Hizen, Chikuzen, Tsushima, Iwami, Izumo, Kaga, Noto, Sado, Echigo, Shinano, Shimotsuke, Iwashiro, Uzen, Ugo, Ishikari and Teshiwo were generally disturbed by local shocks, non-local ones originating, with the exceptions of Shinano and Echigo, very rarely in these districts. On the other hand, Hiuga, Bungo, Tosa, Kii, Mino, and the provinces of Kinai and Tokaido were often disturbed by great non-local shocks, whose origins were generally situated off the eastern coast of Japan, and which were probably caused by faults formed parallel to the latter.

The three north-eastern provinces of Rikuzen, Rikuchu and Nemuro were often disturbed by great earthquakes of sub-oceanic origins. The areas of destructive motion in these cases seems never to have extended to the south of Hitachi and the Peninsula of Kazusa and Awa. Now, as is well known, the group of the Japanese islands forms an arc, whose concavity is turned towards the Japan Sea, and the general geographical distribution of destructive earthquakes in Japan may be summarised

as follows. The provinces on the concave or Japan-Sea side of the arc were disturbed almost only by *local* shocks; while those on the convex or Pacific side of the arc were often disturbed by great *non-local* ones, whose origins were situated in the Ocean and which caused sometimes fearful sea-waves. Of the provinces in the central portion of the Main Island, Mino, Shinano, Shimotsuke and Iwashiro become often the seats of local destructive earthquakes. But the two other provinces of Kotsuke and Hida were very seldom disturbed by destructive earthquakes, and form, together with Tajima and a few provinces in Sanyo-do, the regions seismically most stable in the Main Island.

20. The figures in the 14th column of Table X give, for different provinces, the average intervals of time between two successive destructive earthquakes, as deduced from the numbers in the 3rd column of the same Table. Among others, the mean interval is for Musashi 21 years, and for Sagami 27 years.

VI. Kyoto Earthquakes.

21. Kyoto was the capital of the Empire during the 1070 years between 797 and 1867. The records of earthquakes in this city is therefore most complete, and includes 1308 shocks, of which 34 were destructive, 194 strong, and the remaining 1090 slight.

I shall consider the seismicity in Kyoto under the following three heads: firstly, destructive earthquakes; secondly, strong and slight earthquakes; and thirdly, the annual variation of seismic frequency.

22. *Destructive earthquakes in Kyoto.* In Kyoto, there have been since the 9th century (Table XI) 34 destructive earthquakes, which happened therefore on the average once in about 30 years. Their distribution in time is illustrated in fig. 10.

TABLE XI.

Number of Destructive Earthquakes in Kyoto.

Century.	Number of destructive earthquakes.	Century.	Number of destructive earthquakes.
IX	5	XV	6
X	3	XVI	2
XI	4	XVII	4
XII	3	XVIII	1
XIII	1	XIX	4
XIV	1		

As will be observed from fig. 10, two destructive earthquakes happened sometimes in one year, but at other time none happened in an interval of more than 50 or 100 years. Examples of the latter case are the following: intervals of 65 years between the 22nd July 976 and the 25th August 1041, of 105 years between the 26th August 1245 and the 6th July 1350, of 119 years between the 29th May 1466 and 18th December 1585, and of 123 years between the 28th October 1707 and the 19th August 1830.

In Table XII, the 34 destructive earthquakes in Kyoto are divided into five groups. The interval between the mean epochs of the successive groups varies between 209 and 285 years, giving the average of 240.

As the total number of destructive earthquakes in Kyoto is only 34, it is impossible to determine whether there was any permanent variation in the activity of such earthquakes. But it seems probable that there was nothing of the kind. Thus dividing the interval of 1100 years from the 9th century to

the present time into two equal parts, we find that there were in the first 550 years seventeen, and in the second 550 years also seventeen destructive earthquakes.

TABLE XII.

Time Distribution of Destructive Earthquakes in Kyoto.

Time Interval.	Number of destructive eqkes.	Mean epoch.	Difference.
From yr. month day 827. 8.11 to yr. month day 976. 7.22	8	yr. month 896. 5	years. 236
„ 1041. 8.25 „ 1245. 8.26	8	1132. 0	289
„ 1350. 7. 6 „ 1466. 5.29	7	1421. 0	228
„ 1585.12.18 „ 1707.10.28	7	1649. 4	209
„ 1830. 8.19 „ 1891.10.28	4	1858. 0	
			Mean...240

23. *Strong and small shocks in Kyoto.* In Kyoto there have been since the 9th century 228 strong and destructive earthquakes, whose distribution in time will be evident from fig. 11, the half-century numbers being given in the 3rd column of Table XIII. The total numbers of small earthquakes in Kyoto, which happed in the time interval between the 18th century and the 3rd year of Kei-o (1867), is 1090, the half-century numbers being given in the 4th column of Table XIII. Fig. 9 shows the variation of the general seismic activity in Kyoto from the earliest times, x denoting time in units of 50 years, and y the total seismic activity corresponding to x, obtained by adding together the numbers of small, strong and destructive earthquakes multiplied by cofficients respectively equal to 1,2 and 2.

TABLE XIII.

Half-century Number of Earthquakes in Japan and Kyoto.

Time interval.	Destructive eqkes in Japan.	Destructive and strong eqkes in Kyoto.	Small eqkes in Kyoto.	Total activity in Kyoto.
yr. yr.				
400- 449	1			
450- 499	0			
500- 549	0			
550- 599	1			
600- 649	0			
650- 699	2			
700- 749	8			
750- 799	2		3	3
800- 849	5	6	88	100
850- 899	11	15	327	357
900- 949	2	3	55	61
950- 999	1	11	15	37
1000-1049	1	4	3	11
1050-1099	3	8	21	37
1100-1149	1	7	20	34
1150-1199	4	12	9	33
1200-1249	8	11	18	40
1250-1299	5	2	6	10
1300-1349	3	11	23	45
1350-1399	5	33	79	145
1400-1449	14	31	90	152
1450-1499	11	29	68	126
1500-1549	15	17	38	72
1550-1599	11	8	35	51
1600-1649	21	7	70	84
1650-1699	21	4	26	34
1700-1749	12	2	42	46
1750-1799	8	2	46	50
1800-1849	13	0	5	5
1850-1898	20	5	—	—
Sum	209	228	1090	

Both fig. 9 and fig. 11 indicate a well pronounced maximum in the 15th century, followed by a minimum in the latter half of the 17th and the first half of the 18th century. The seismic activity in Kyoto at the present time seems to be on its way to a second maximum, which may happen possibly 150 or 200 years hence. Anyway it seems not prudent to conclude that the seismic activity in Kyoto is gradually dying away[1]. The curve of total seismic activity in Kyoto, fig. 9, indicates a well-pronounced maximum in the latter half of the 9th century, in which interval the number of small shocks alone amounted to 327. We can not, however, conclude from this at once that the seismic activity in Kyoto reached really its *absolute* maximum in the 9th century. For, the predominating element of the curve in fig. 9 is formed by small earthquakes, whose recorded number, it must be observed, would largely depend on the state of the development of literature of the times. As the 9th century was one of the epochs in Japanese history, in which our literature greatly flourished, the record of earthquakes in this century is doubtless much more complete than in some others. On the other hand, the number of records of destructive and strong earthquakes would be influenced to a comparatively insignificant amount by the state of the times; and according to fig. 11, which illustrates the time-distribution of 228 destructive and strong earthquakes in Kyoto, the maximum in the latter half of the 9th century was much smaller than that in the 15th century.

24. Finally I give in Table XIV, for the sake of reference, the yearly numbers of earthquakes in Kyoto during 13 years between 1885 and 1897. The numbers for the two years, 1891

1) See Professor John Milne's paper: Note on the Great Earthquakes in Japan. *Trans. Seis. Soc. Japan.* Vol. III.

and 1892, are, owing to the after-shocks of the great Mino-Owari earthquake of the 28th October 1891, unusually great. The mean yearly number of earthquakes in Kyoto, deduced from the other eleven years, is 5.

TABLE XIV.

Yearly Earthquake Numbers in Kyoto. (Between 1885 and 1897).

Year.	Number of eqkes.	Year.	Number of eqkes.
1885	5	1892	25
1886	2	1893	5
1887	6	1894	6
1888	5	1895	14
1889	2	1896	9
1890	2	1897	3
1891	102		

25. *The annual variation of seismic frequency in Kyoto.* The monthly distribution of 228 strong earthquakes[1] in Kyoto is shown in Tables XV, XVI and XVII, and illustrated in figs. 13 and 15.

According to Table XV, the maximum monthly numbers of 29 and 28 occurred respectively in August and December, and the minimum of 13 both in February and September, the ratio of the greatest and least numbers being as 2.2:1. According to Table XVI, the maximum seasonal number of 65 occurred in Summer and the minimum of 52 in Autumn, the ratio of the two numbers being as 1.3:1. Comparing Tables XV and XVI with Tables III and IV, we find that the months and seasons of the maximum and minimum seismic frequencies were nearly identical for strong earthquakes in Kyoto and

1) Including 34 destructive earthquakes.

destructive earthquakes in Japan, the ratio of the maximum and minimum for the former being, however, smaller than that for the latter.

TABLE XV.

Monthly Distribution of 228 Destructive and Strong Earthquakes in Kyoto.

Month.	Number of earthquakes.
I	16
II	13
III	22
IV	14
V	18
VI	16
VII	20
VIII	29
IX	13
X	17
XI	22
XII	28

TABLE XVI.

Seasonal Distribution of 228 Destructive and Strong Earthquakes in Kyoto.

Season.		Number of earthquakes.
Spring	March. April. May.	54
Summer	June. July. August.	65
Autumn	September. October. November.	52
Winter	December. January February.	57

TABLE XVII.

Semi-annual Distribution of 228 Destructive and Strong Earthquakes in Kyoto.

Division of the year.		Number of earthquakes.
Warmer months	April, May, June, July, August, September.	110
Colder Months	October, November, December, January, February, March.	118

26. The monthly distribution of 1088 small earthquakes in Kyoto, whose dates are exactly known, is shown in Tables XVIII, XIX and XX, and illustrated in figs. 12 and 14. According to Table XVIII, the maximum monthly number of 110 occurred in March, and the minimum of 74 in September, the ratio of the two numbers being as 1.5:1. Comparing fig. 12 with fig. 13, we find that for Kyoto the August maximum, which is very well marked in the frequency of the strong earthquakes, is reduced to a mere trace in the case of the small earthquakes. According to Table XIX, the maximum seasonal number of 307 occurred in Spring, and the minimum of 252 in Winter, the ratio of the two numbers bring as 1.2:1.

Finally, according to Table XX, there exists no difference between the number of small earthquakes in Kyoto for the warmer and colder halves of the year.

The occurrence of minimum frequencies of Kyoto small earthquakes in Autumn and Winter does not agree with the annual variation of ordinary small earthquakes in Japan, illustrated in fig. 4, which presents the minimum in Summer. There may possibly exist some seismic peculiarity inherent in the region about Kyoto, causing its annual variation to differ from that for other parts of Japan.

TABLE XVIII.

Monthly Distribution of 1088 Small Earthquakes in Kyoto.

Month.	Number of earthquakes.
I	79
II	82
III	110
IV	102
V	95
VI	91
VII	87
VIII	95
IX	74
X	87
XI	95
XII	91

TABLE XIX.

Seasonal Distribution of 1088 Small Earthquakes in Kyoto.

Season.		Number of earthquakes.
Spring	March. April. May.	307
Summer	June. July. August.	273
Autumn	September. October. November.	256
Winter.	December. January. February.	252

TABLE XX.

Semi-annual Distribution of 1088 Small Earthquakes in Kyoto.

Division of the year.		Number of earthquakes.
Warmer months	April, May, June, July, August, September.	544
Colder months	October, November, December, January, February, March.	544

27. *Secular variation of seismic activity in Kyoto.* Tables XXI and XXII give respectively the yearly numbers of earthquakes in Kyoto for the two most disturbed epochs, namely, the 9th century and the time interval between 1340 and 1609, the *total activity* for each year being the sum of the numbers of small, strong and destructive earthquakes multiplied respectively with the coefficents 1, 2 and 2. The results contained in these two tables are illustrated in figs. 16 and 17, from which it will be seen that the seismic activity presents a series of fluctuations of periods varying between a few years and a few dozen years. The curve for the 9th century indicates more or less definitely a period of the average length of $6\frac{1}{2}$ years. In figs. 16 and 17, each of the small circles (○) on the abscissa axis indicates a destructive earthquake in Kyoto, and it may be observed that about the year 1360 small earthquakes were very frequent in Kyoto, but these were accompanied by no destructive shock.

TABLE XXI.

Yearly Earthquake Numbers in Kyoto. (Between 800 and 899).

Year.	Slight.	Strong.	Destructive.	Total activity.	Year.	Slight.	Strong.	Destructive.	Total activity.
800				0	826	7			7
801				0	827	2		1	4
802				0	828	5	1		7
803				0	829	3	1		5
804	2			2	830	4			4
805	3			3	831	3			3
806	1			1	832	7			7
807		1		2	833	1	1		3
808				0	834	1			1
809				0	835	1			1
810	1			1	836	2	1		4
811				0	837	3			3
812	1			1	838	2			2
813				0	839	2			2
814				0	840	2			2
815				0	841				0
816	1			1	842	6			6
817				0	843	3			3
818	3			3	844				0
819				0	845	2			2
820				0	846	1			1
821				0	847				0
822				0	848	9			9
823	2			2	849	5			5
824	1			1	850	8			8
825	2			2	851	11			11

Year.	Slight.	Strong.	Destructive.	Total activity.	Year.	Slight.	Strong.	Destructive.	Total activity.
852	10			10	876	6			6
853	10			10	877	3	2		7
854	6			6	878	6			6
855	16			16	879	11			11
856	19		1	21	880	10	1		12
857	13			13	881	15	1	1	19
858	6			6	882	4			4
859	5	1		7	883	4			4
860	13			13	884	4			4
861	8			8	885	5			5
862	16	1		18	886	3	2		7
863	8			8	887	4		1	6
864	3	1		5	888				0
865	8			8	889				0
866	7			7	890				0
867	12			12	891				0
868	7		1	9	892				0
869	5			5	893				0
870	7			7	894				0
871	6			6	895				0
872	13			13	896				0
873	13	1		15	897				0
874	12			12	898		1		2
875	9	1		11	899	1			1

TABLE XXII.

Yearly Earthquake Numbers in Kyoto. (Between 1340 and 1609.)

Year.	Slight.	Strong.	Destructive.	Total activity.	Year.	Slight.	Strong.	Destructive.	Total activity.
1340		1		2	1366				0
1341	1	1		3	1367		3		6
1342	1			1	1368	2			2
1343				0	1369		1		2
1344	2			2	1370				0
1345	2			2	1371	1	2		5
1346		1		2	1372	1			1
1347	11	2		15	1373	4	2		8
1348	2			2	1374				0
1349	2	1		4	1375	2			2
1350	7	2	1	13	1376		1		2
1351	4	1		6	1377				0
1352	3			3	1378		1		2
1353				0	1379		1		2
1354				0	1380	1			1
1355	1			1	1381	3			3
1356	5			5	1382				0
1357	5			5	1383	3	1		5
1358	8	2		12	1384				0
1359	2			2	1385				0
1360	2			2	1386				0
1361	3	5		13	1387				0
1362	10	2		14	1388			1	2
1363	3	5		13	1389				2
1364	6			6	1390		1		0
1365				0	1391		1		2

Year.	Slight.	Strong.	Destructive.	Total activity.	Year.	Slight.	Strong.	Destructive.	Total activity.
1392				0	1421	1			1
1393				0	1422	2			2
1394				0	1423	8			8
1395	1	1		3	1424	1			1
1396				0	1425	4	4	1	14
1397				0	1426	14	1		16
1398	2			2	1427	4			4
1399				0	1428		1		2
1400	1		1	3	1429	1			1
1401	1			1	1430				0
1402		1		2	1431	3			3
1403	3			3	1432				0
1404				0	1433	4	4		12
1405	1	2		5	1434	5	1		7
2406				0	1435	6	1		8
1407		1		2	1436	1			1
1408	2		1	4	1437	2			2
1409	2			2	1438	3			3
1410	2	1		4	1439	1	1		3
1411	1	2		5	1440		1		2
1412	4	1		6	1441				0
1413		1		2	1442	1	1		3
1414				0	1443	4			4
1415				0	1444		1		2
1416				0	1445			1	2
1417				0	1446	1			1
1418				0	1447		1		2
1419	2			2	1448				0
1420		1		2	1449	5		1	7

Year.	Slight.	Strong.	Destructive.	Total activity.	Year.	Slight.	Strong.	Destructive.	Total activity.
1450	3			3	1479	1			1
1451	3			3	1480				0
1452		1		2	1481	2			2
1453				0	1482	2			2
1454				0	1483				0
1455				0	1484				0
1456		1		2	1485				0
1457	1			1	1486	1			1
1458	1	1		3	1487	1			1
1459	1			1	1488				0
1460	9	3		15	1489	3	3		9
1461				0	1490				0
1462		1		2	1491	2			2
1463				0	1492		1		2
1464		1		2	1493	2	2		6
1465	1			1	1494	2	1		4
1466	4		1	6	1495	1			1
1467	5	2		9	1496	1			1
1468	5	1		7	1497		1		2
1469				0	1498	4	3		10
1470	1			1	1499	8	1		10
1471		2		4	1500	7			7
1472				0	1501	1			1
1473				0	1502				0
1474				0	1503	2			2
1475	2	1		4	1504		1		2
1476				0	1505	1			1
1477	2	1		4	1506	2	1		4
1478				0	1507	1	2		5

Year.	Slight.	Strong.	Destructive.	Total activity.	Year.	Slight.	Strong.	Destructive.	Total activity.
1508	1			1	1537				0
1509	2			2	1538				0
1510	2	1		4	1539				0
1511	5			5	1540				0
1512	3	1		5	1541				0
1513				0	1542	1			1
1514	2	2		6	1543				0
1515				0	1544				0
1516		1		2	1545				0
1517		2		4	1546				0
1518				0	1547				0
1519		1		2	1548				0
1520	1	1		3	1549		1		2
1521		1		2	1550	1			1
1522				0	1551				0
1523				0	1552				0
1524	1			1	1553				0
1525	1			1	1554	1			1
1526	2			2	1555				0
1527		1		2	1556		1		2
1528				0	1557		1.		2
1529		1		2	1558	1			1
1530				0	1559				0
1531	1			1	1560				0
1532				0	1561	1			1
1533	3			3	1562	1			1
1534				0	1563	1			1
1535				0	1564	1	1		3
1536				0	1565	1			1

Year.	Slight.	Strong.	Destructive.	Total activity.	Year.	Slight.	Strong.	Destructive.	Total activity.
1566	1			1	1588	1			1
1567	1			1	1589				0
1568	5			5	1590				0
1569	1			1	1591				0
1570	3			3	1592				0
1571				0	1593	2			2
1572	2	1		4	1594				0
1573	1			1	1595		1		2
1574				0	1596		2	1	6
1575	1			1	1597				0
1576				0	1598	5			5
1577				0	1599	4			4
1578				0	1600		4		8
1579				0	1601	2			2
1580				0	1602	8			8
1581				0	1603	3			3
1582	1			1	1604	10	1		12
1583				0	1605	2			2
1584				0	1606	1			1
1585			1	2	1607	1			1
1586				0	1608				0
1587				0	1609	3			3

28. *Earthquakes in Yedo (Tokyo).* In Yedo (Tokyo) there have been since the 17th century 12 destructive earthquakes whose time distribution is illustrated in fig. 18. They were most frequent in the first half of the 17th century, when there were seven in the interval of 34 years and 3 months between the 26th June 1615, and the 1st September 1649, the mean interval between two successive shocks being 4 years and 11 months. Especially in 1649, there were two destructive earthquakes. On the other hand, there was not one destructive earthquake in the interval of 79 years between the 31st December 1703 and the 23rd August 1782.

In the course of the 245 years between the 1st September 1649 and the 20th June 1894, there were in Yedo (Tokyo) five destructive earthquakes, the mean interval being 49 years. If we simply count all the destructive earthquakes since the 17th century, the average interval becomes 25 years.

29. For the sake of reference I give in Table XXIII the yearly earthquake numbers in Tokyo during the 23 years between 1876 and 1898.

TABLE XXIII.

Yearly Earthquake Numbers in Tokyo. (Between 1876 and 1898).

Year.	Number of eqkes.	Year.	Number of eqkes.
1876	56	1888	101
1877	71	1889	113
1878	50	1890	93
1879	70	1891	123 (Modified number 97)
1880	77	1892	73
1881	64	1893	59
1882	46	1894	101 (Modified number 85)
1883	32	1895	122
1884	68	1896	216 (Modified number 184)
1885	68	1897	157 (Modified number 136)
1886	54	1898	
1887	80	Mean	82

The great earthquake numbers for October 1891, March 1894, June 1896, and August 1897 were due to the after-shocks of four great earthquakes, which took place respectively in these four months. To obtain proper numbers for the four years concerned, the numbers for the above four months have been subtracted from the total numbers of the respective years, the remainder in each case being then multiplied by the factor $\frac{12}{11}$.

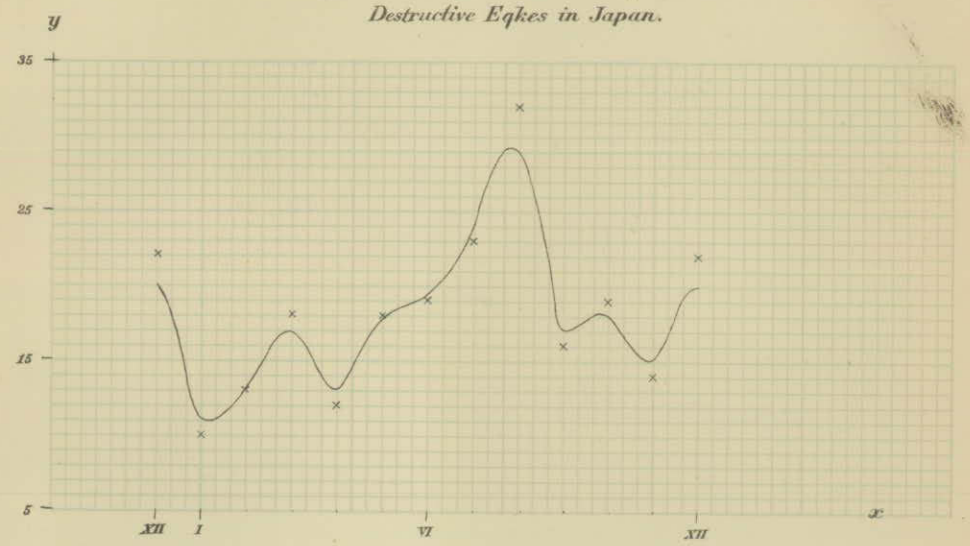
The results thus obtained, which are entered as *modified numbers*, have been utilised in drawing the curve of the yearly seismic frequency in Tokyo, fig. 19. The minima occurred in 1883 and 1893, and the maxima in 1880, 1889 and 1896. The

maximum in 1896 was the absolutely greatest in the time interval under consideration, the seismic frequency at the present time being probably on its way to a minimum. When looked at generally there seems to exist a period of long duration, the frequency, in the mean, increasing during the 23 years from 1878 to the present time.

December, 1898.

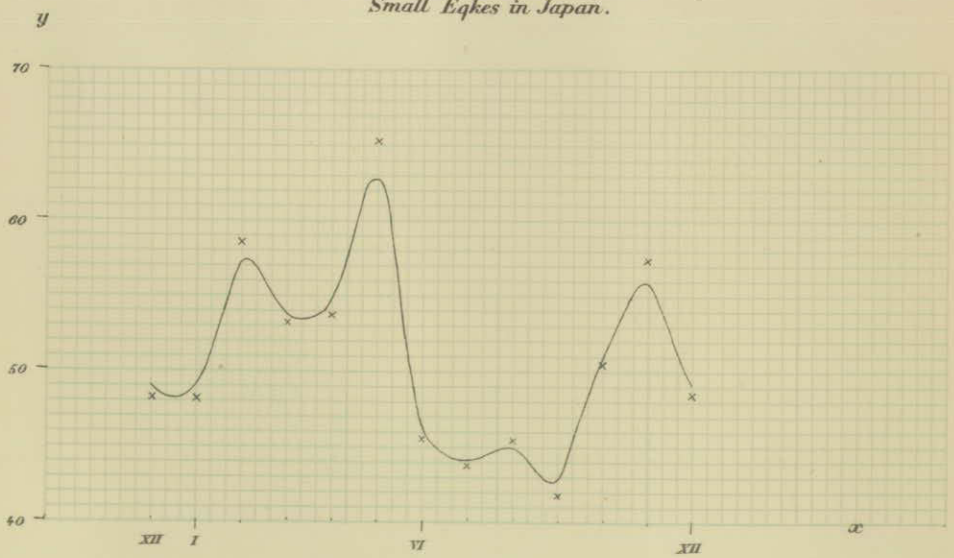
Seismological Institute,
Tokyo.

Fig. 1. Monthly Distribution of 216 Destructive Eqkes in Japan.



x = Month.
y = Monthly number of destructive eqkes.

Fig. 2. Monthly Distribution of Ordinary Small Eqkes in Japan.



x = Month.
y = Mean monthly number of ordinary small eqkes.

Fig. 3. Seasonal Distribution of 216 Destructive Eqkes in Japan.

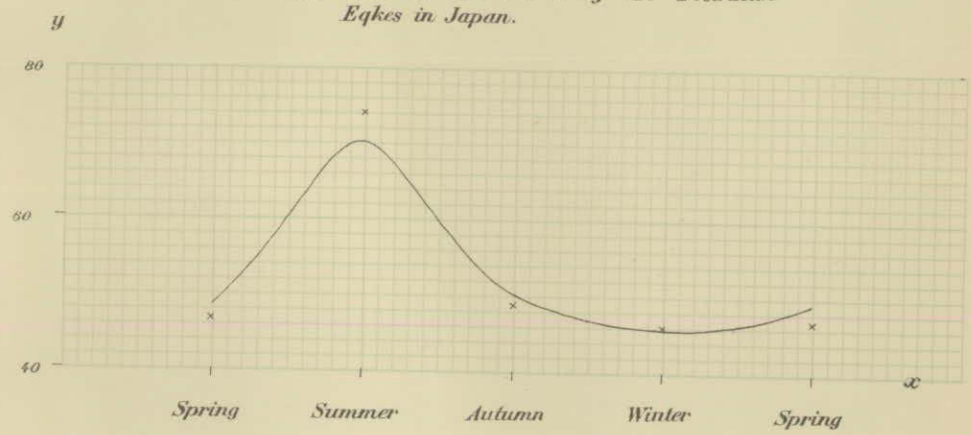
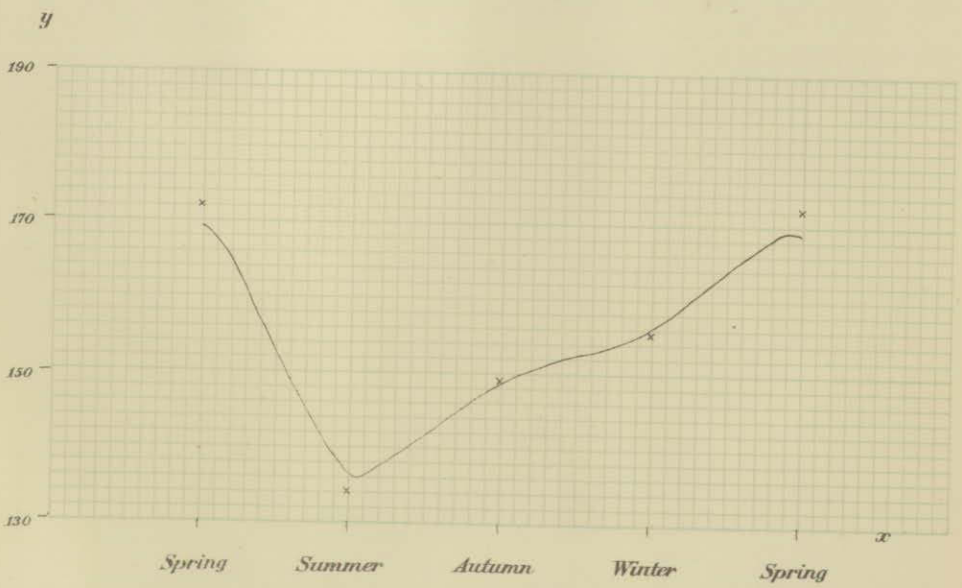
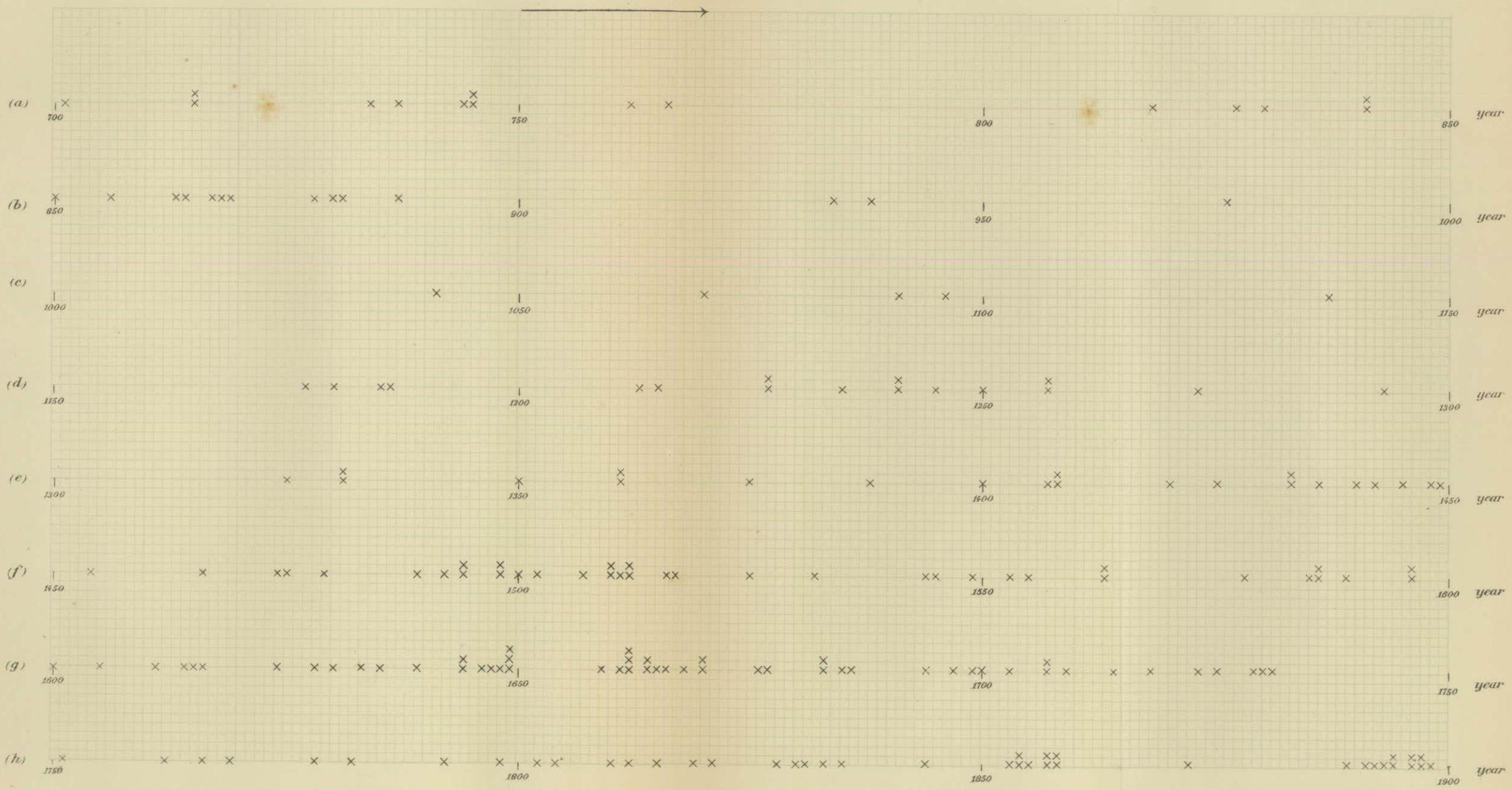


Fig. 4. Seasonal Distribution of Ordinary Small Eqkes in Japan.



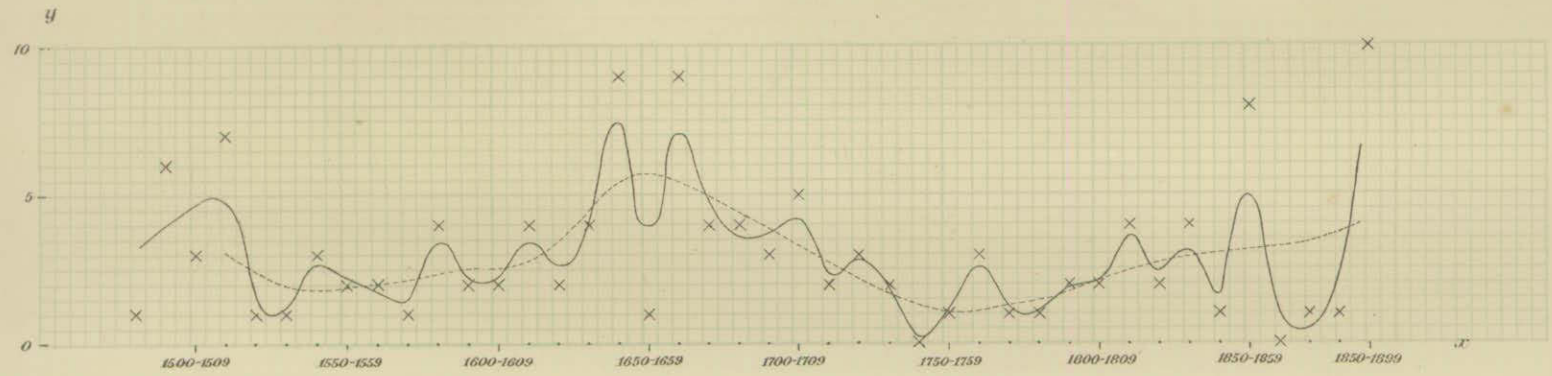
For Figs. 3 and 4, $\cdots\cdots \begin{cases} x = \text{Month.} \\ y = \text{Monthly number of eqkes.} \end{cases}$

Fig. 5. Time Distribution of Destructive Eqkes in Japan; Formosa, Hokkaido and Liu-Kiu excepted. (From the 8th century to the present time.)



Each sign (x) marks a destructive eqke; when two or more such shocks happened in a single year, the signs are put one over the other.
(b) is the continuation of (a), (c) that of (b), etc.

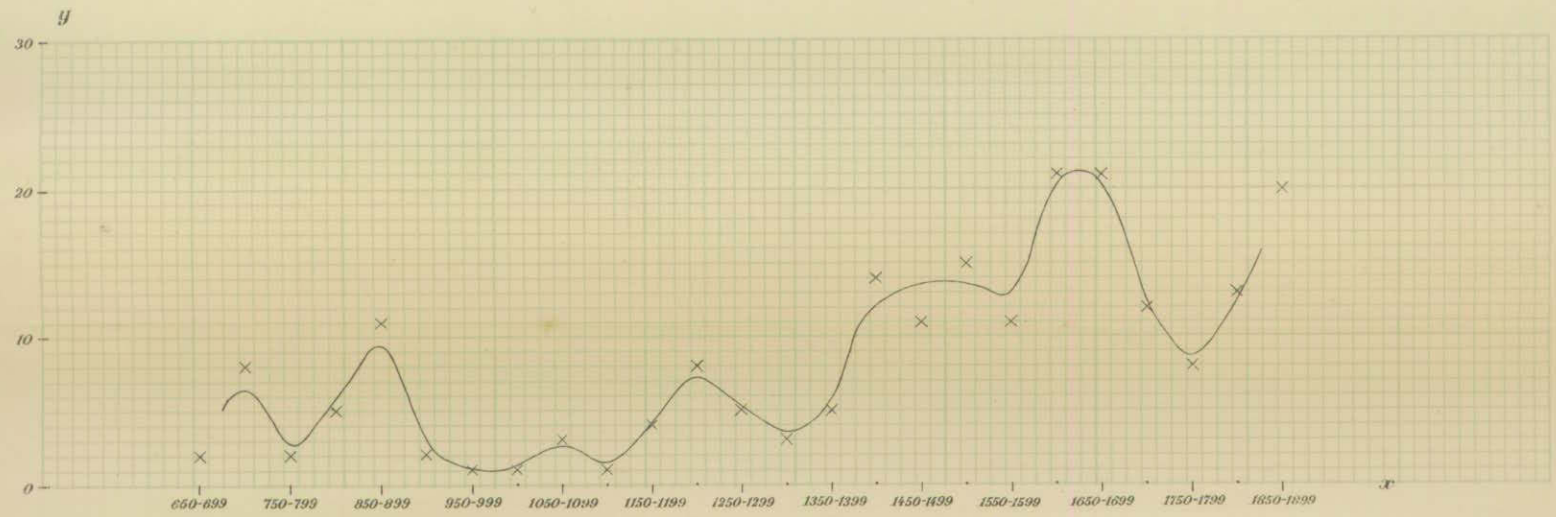
Fig. 6. Frequency of Destructive Eqkes in Japan, Formosa Hokkaido and Liu-Kiu excepted. (From the 16th century to the present time.)



x=Time in intervals of 10 years. *y=Number of destructive eqkes during 10 years.*

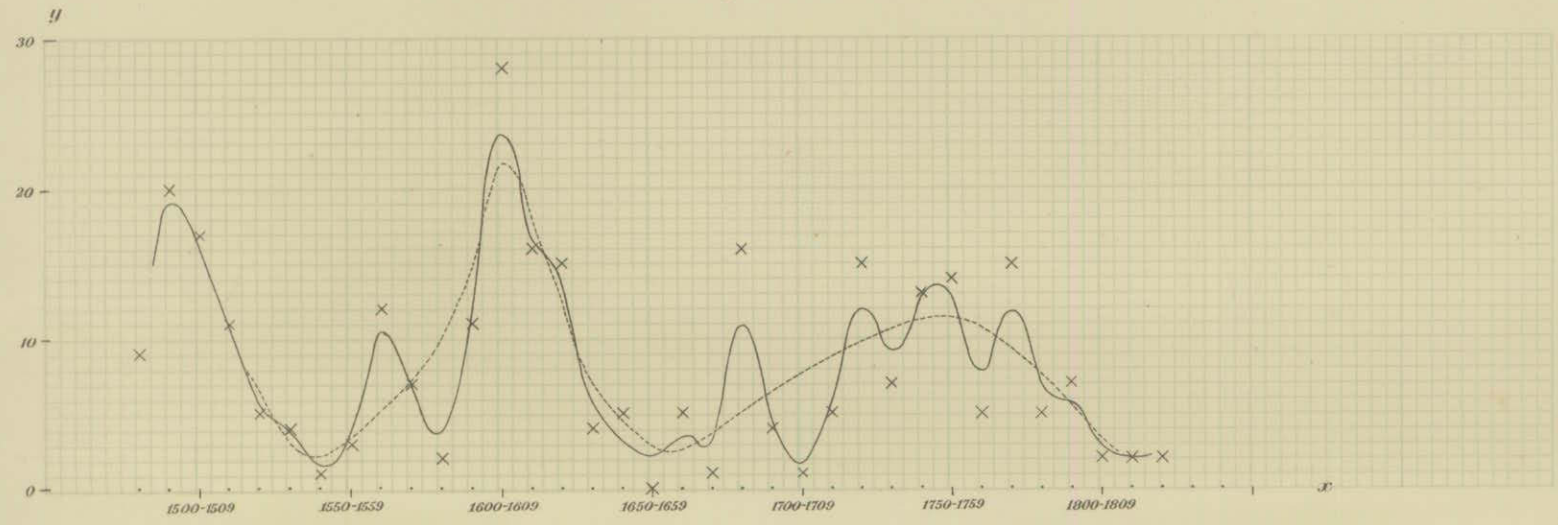
The dotted line is drawn through mean positions of the curve.

Fig. 7. Frequency of Destructive Eqkes in Japan, Formosa Hokkaido and Liu-Kiu excepted. (From the 16th century to the present time.)



x=Time in intervals of 10 years. *y=Number of destructive eqkes during 10 years.*

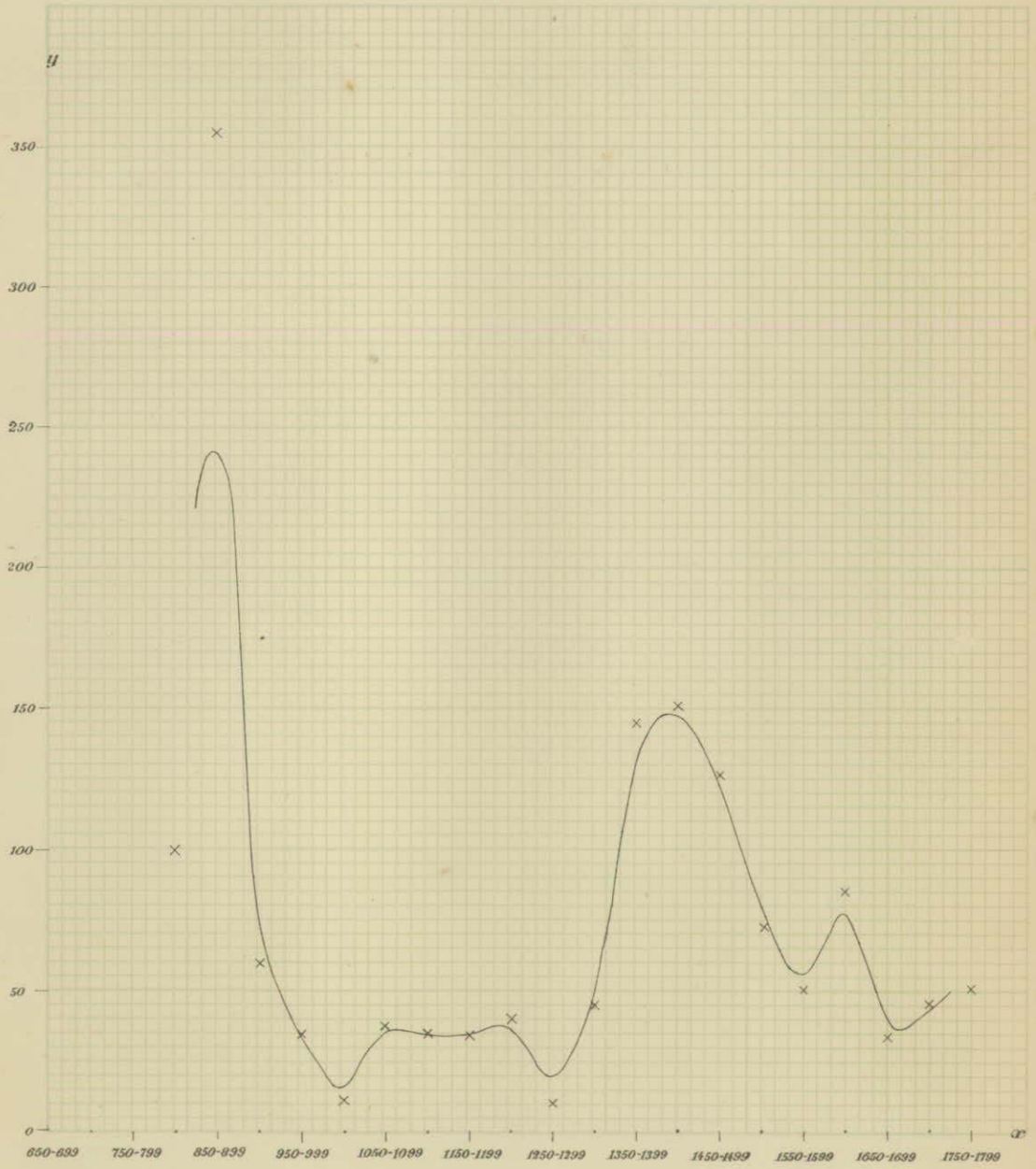
Fig. 8. Frequency of Small Eqkes in Kyoto. (From the 16th to the 18th century.)



x=Time in intervals of 10 years. *y=Number of small eqkes in Kyoto during 10 years.*

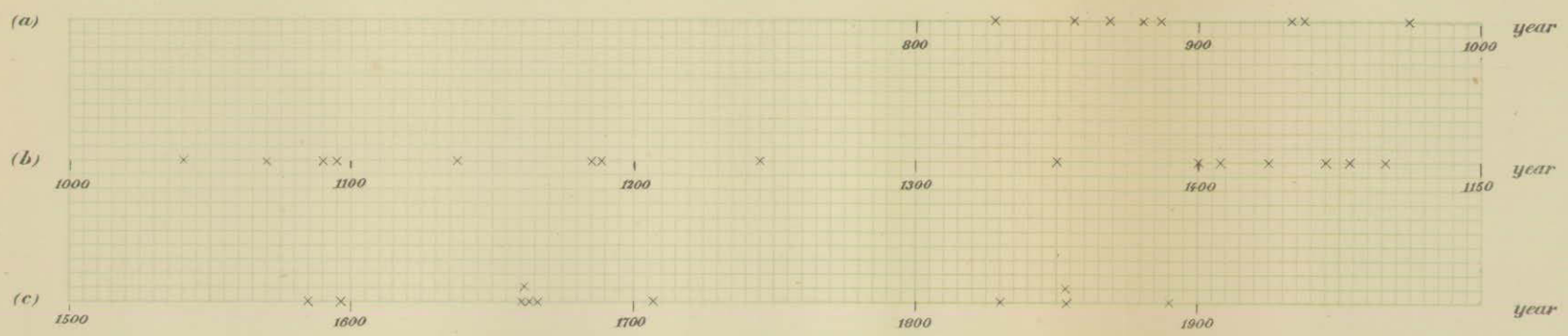
The dotted line is drawn through mean positions of the curve.

Fig. 9. Seismic Activity in Kyoto.
(From the 8th to the 18th century.)



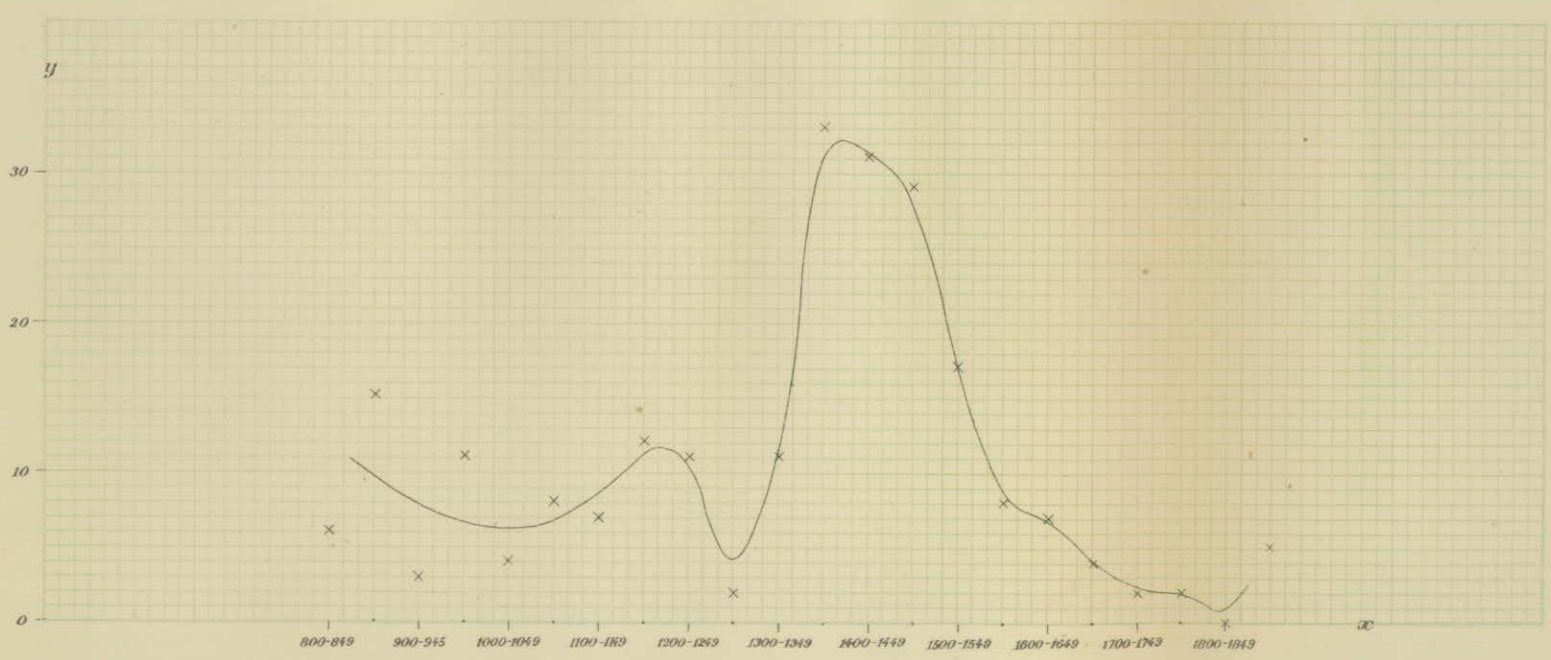
x = Time in intervals of 50 years.
y = Number of eqkes during 50 years.

Fig. 10. Time Distribution of 34 Destructive Eqkes in Kyoto.
(From the 8th century to the present time.)



Each sign (×) marks a destructive eqke; when two such eqkes happened in a single year, the signs are put one over the other.
(b) is the continuation of (a), and (c) that of (b).

Fig. 11. Frequency of Strong and Destructive Eqkes in Kyoto
(From the 9th century to the present time.)



x=Time in intervals of 50 years.
y=Total seismic activity during 50 years.

Fig. 12. Monthly Distribution of 1088 Small Eqkes in Kyoto.

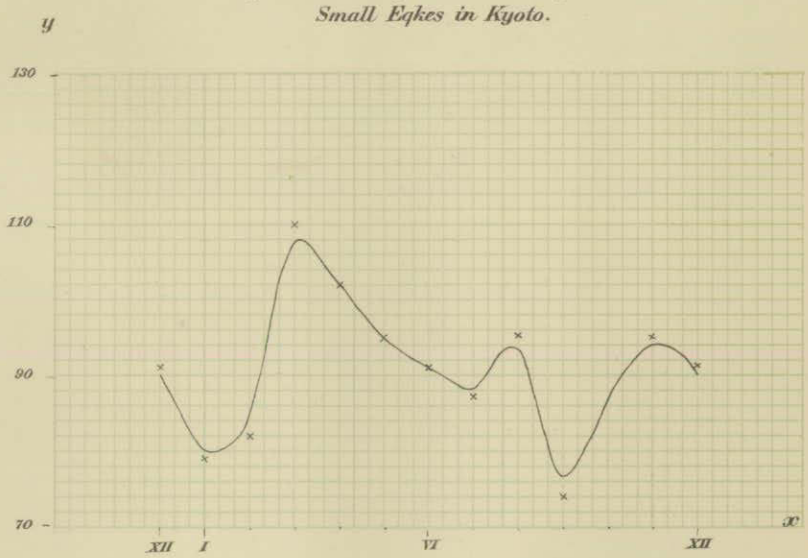
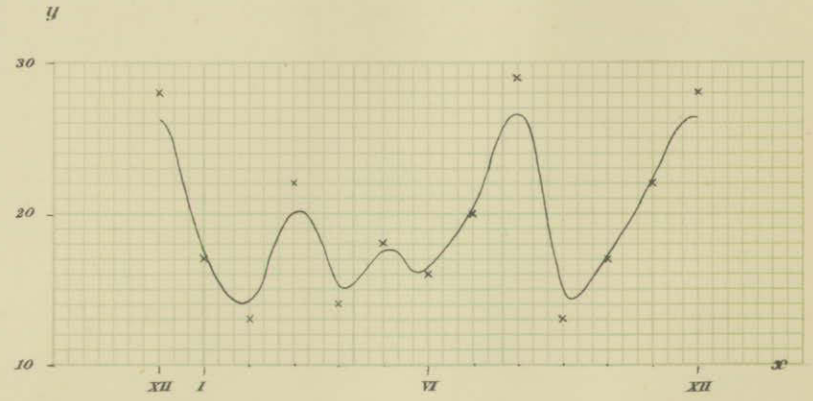


Fig. 13. Monthly Distribution of 228 Strong and Destructive Eqkes in Kyoto.



For Figs. 12 and 13 ..... $\begin{cases} x = \text{Month.} \\ y = \text{Monthly number of eqkes.} \end{cases}$

Fig. 14. Seasonal Distribution of 1088 Small Eqkes in Kyoto.

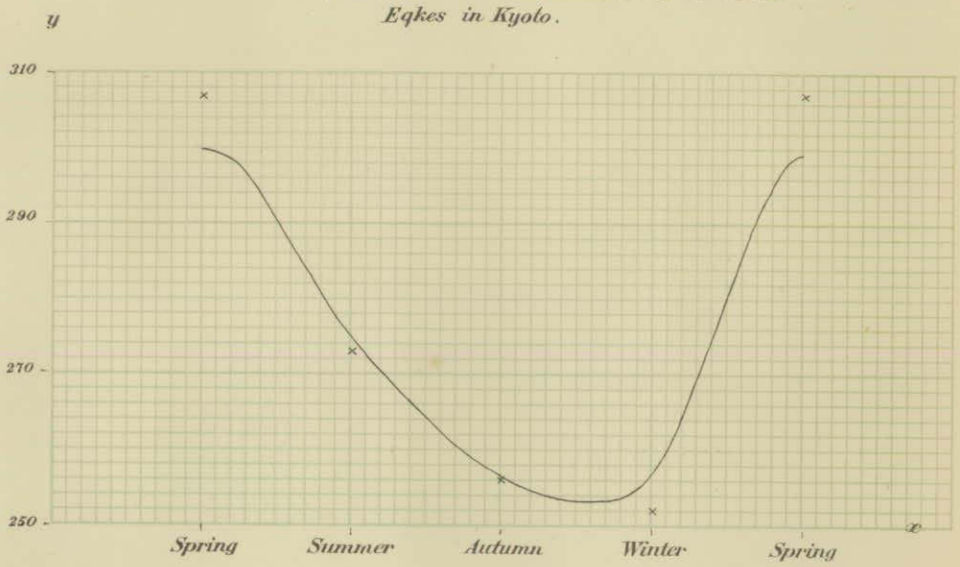
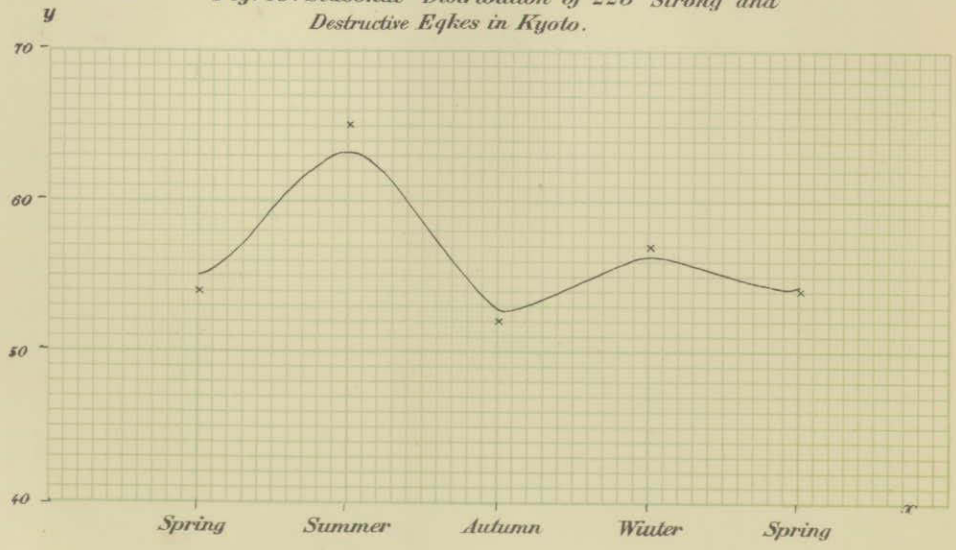
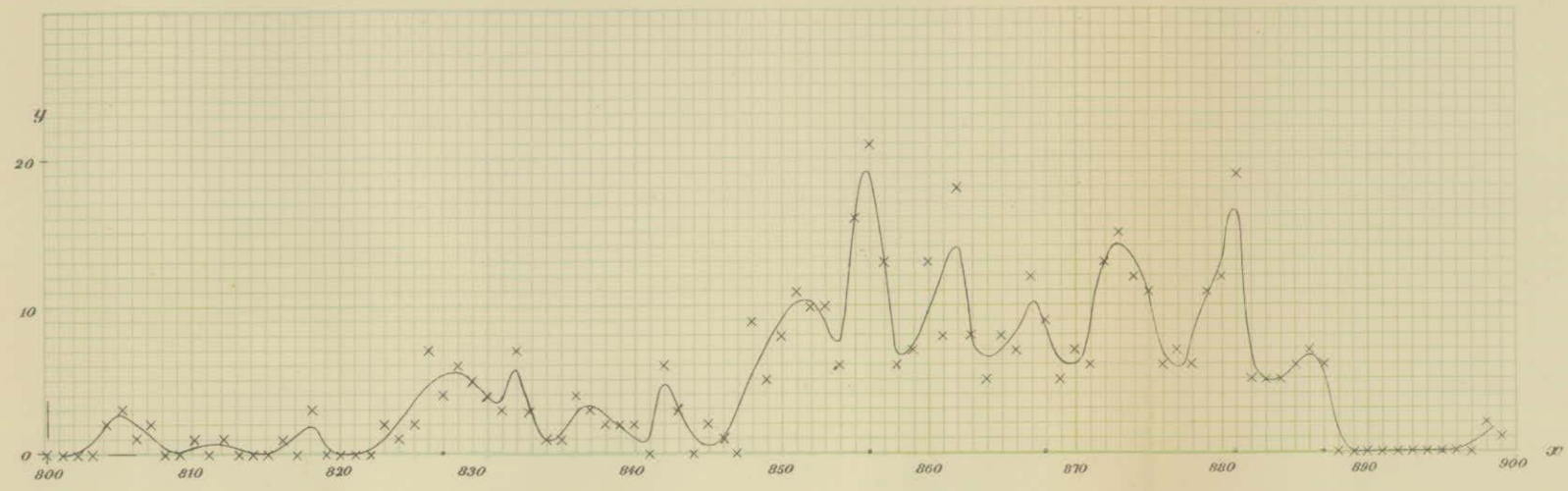


Fig. 15. Seasonal Distribution of 228 Strong and Destructive Eqkes in Kyoto.



For Figs. 14 and 15, $\begin{cases} x = \text{Season}. \\ y = \text{Seasonal number of eqkes}. \end{cases}$

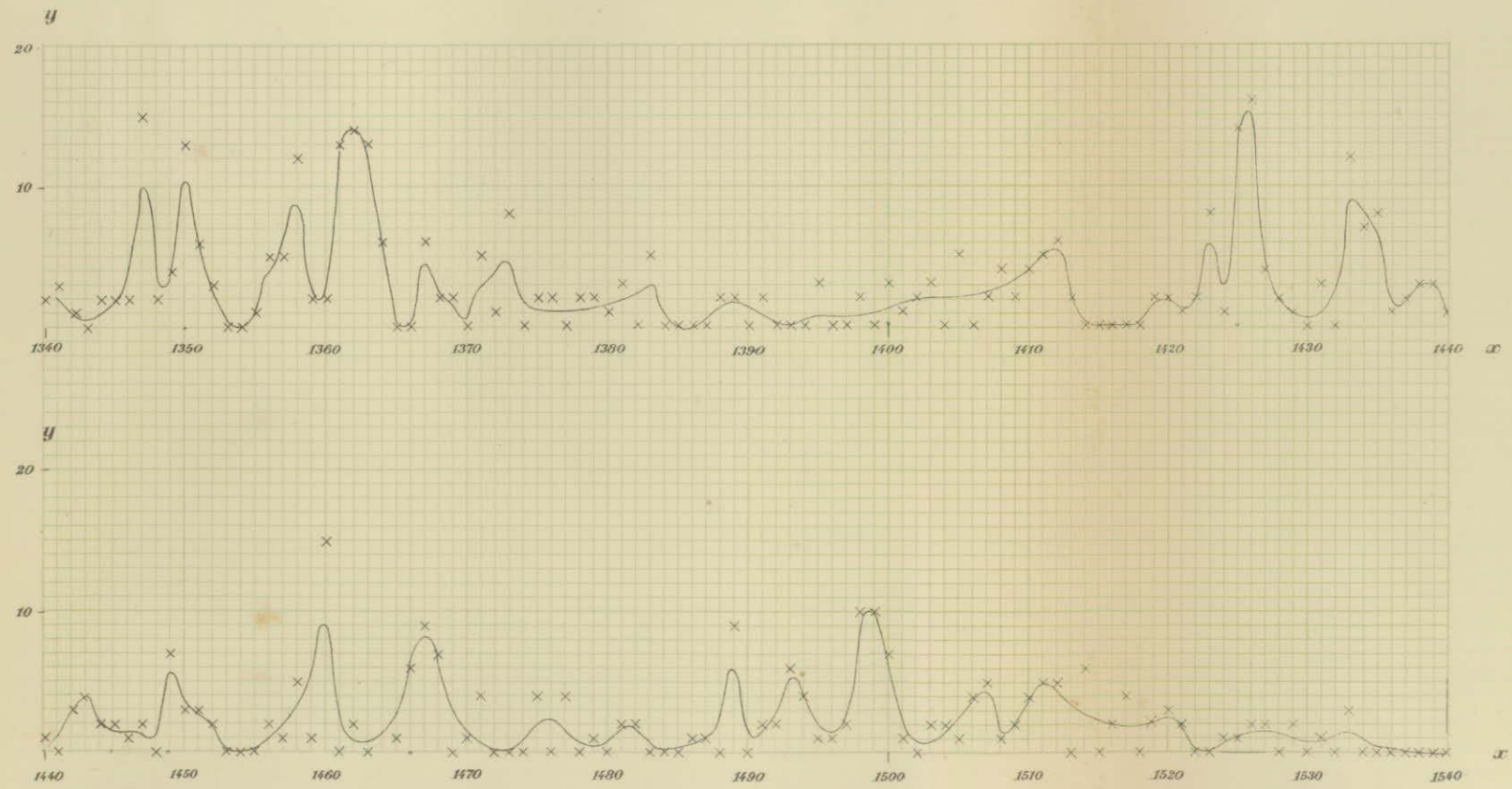
Fig. 16. Seismic Activity in Kyoto during the 9th Century.



x=Time in years. *y=Yearly seismic activity.*

Each small circle (○) in the abscissa axis indicates a destructive eqke in the year specified.

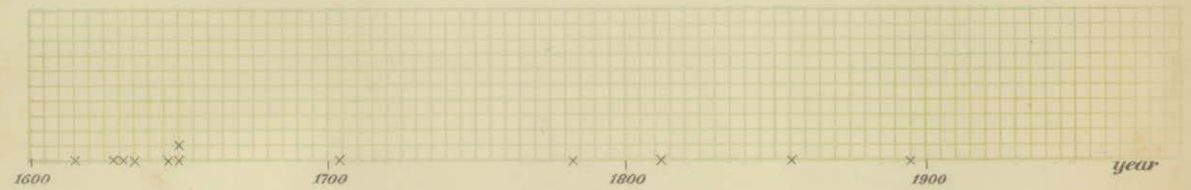
Fig. 17. Seismic Activity in Kyoto.
(Between 1340 and 1540.)



x=Time in years. *y=Yearly seismic activity.*

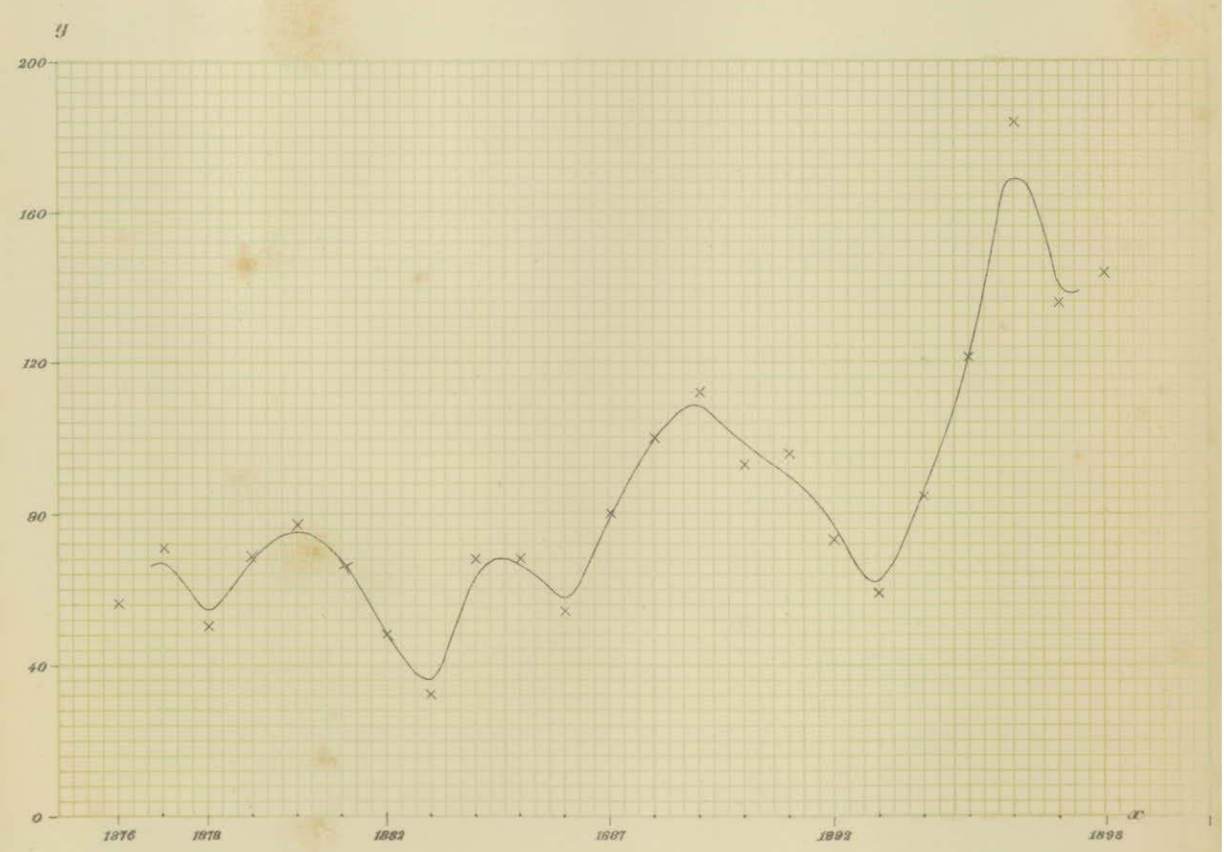
Each small circle (○) in the abscissa axis indicates a destructive eqke in the year specified.

Fig. 18. Time Distribution of 12 Destructive Eqkes in Yedo (Tokyo) (From the 17th century to the preseqt time.)



Each sign (×) marks a destructive eqke; when two such shocks happened in a single year, the signs are put one over the other.

Fig. 19 Seismic Frequency in Tokyo. (From 1876 to 1898.)



x=Time in years. *y=Yearly number of eqkes in Tokyo.*

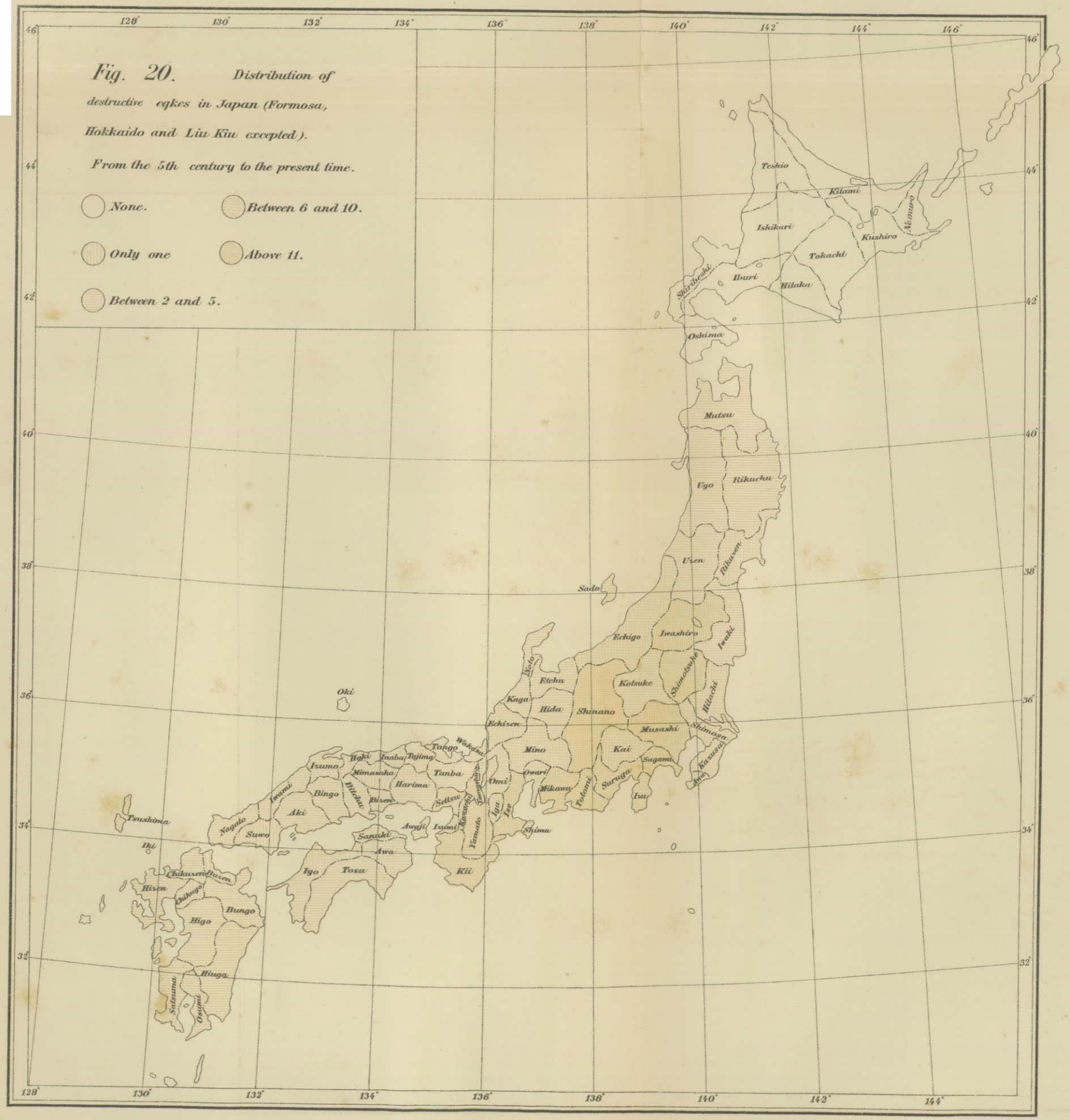


Fig. 20. Distribution of destructive eqkes in Japan (Formosa, Hokkaido and Liu Kiu excepted). From the 5th century to the present time.
None.
Only one
Between 2 and 5.
Between 6 and 10.
Above 11.
128° 130° 132° 134° 136° 138° 140° 142° 144° 146°
46° 44° 42° 40° 38° 36° 34° 32°
Teshio
Kitami
Ishikari
Kushiro
Nemuro
Tokachi
Shiribeshi
Iburi
Hidaka
Oshima
Mutsu
Ugo
Rikuchu
Uzen
Rikuzen
Sado
Echigo
Iwashiro
Iwaki
Hoku
Etchu
Kaga
Hida
Kotsuke
Shimotsuke
Hitachi
Echizen
Shinano
Musashi
Shimosa
Kazusa
Awa
Mino
Kai
Sagami
Owari
Mikawa
Totomi
Suruga
Izu
Oki
Wakasa
Tango
Tajima
Inaba
Hoki
Izumo
Mimasaka
Tamba
Harima
Bizen
Bitchu
Bingo
Iwami
Aki
Settsu
Kawachi
Yamato
Iga
Ise
Shima
Omi
Tsushima
Nagato
Suwo
Awaji
Izumi
Sanuki
Awa
Kii
Iki
Iyo
Tosa
Chikuzen
Buzen
Hizen
Chikugo
Bungo
Higo
Hiuga
Satsuma
Osumi


Fig. 21. Distribution of destructive eqkes in Japan (Formosa and Liu Kiu excepted).
From the 17th century to the present time.
None.
Only one
Between 2 and 5.
Between 6 and 10.
Above 11.
Teshio
Kitami
Ishikari
Nemuro
Kushiro
Tokachi
Shiribeshi
Iburi
Hitaka
Oshima
Mutsu
Ugo
Rikuchu
Uzen
Rikuzen
Sado
Echigo
Iwashiro
Iwaki
Noto
Etchu
Kotsuke
Shimotsuke
Hitachi
Kaga
Hida
Shinano
Echizen
Musashi
Shimosa
Mino
Kai
Sagami
Kazusa
Awa
Tango
Wakasa
Tajima
Inaba
Hoki
Izumo
Mimasaka
Harima
Tanba
Omi
Owari
Mikawa
Totomi
Suruga
Izu
Iwami
Bingo
Bitchu
Bizen
Settsu
Yamato
Iga
Ise
Aki
Nagato
Suwo
Awaji
Izumi
Shima
Sanuki
Awa
Iyo
Tosa
Kii
Oki
Tsushima
Iki
Chikuzen
Buzen
Hizen
Chikugo
Bungo
Higo
Hiuga
Satsuma
Osumi