VI. Relative Magnitudes of the Quick and the Slow Vibrations occurring in an earthquake.

§ 10. The following table gives the maximum ranges of motion (double amplitude) of the quick and the slow vibrations occurring in the different earthquakes of Groups II—IX; *quick vibrations* meaning those whose period is less than, or about equal to 1 sec., and *slow vibrations* those whose period is much longer and amounts to several seconds.

TABLE XX.

RELATIVE MAGNITUDES OF QUICK AND SLOW VIBRATIONS. GROUPS II—VIII.

Group.	Eqke No.	Max. 2a of slow vibration.	Max. 2a of quick vibration.
		mm	mm
II	20	1,70	0,38
III	59	3,10	1,80
	62	0,06	0,04
	67	0,09	0,04
	101	10,90	7,00
	118	0,04	0,04
	230	5,90	3,90
	263	0,21	0,30
	375	0,06	0,09
VI	257	0,13	0,17
		mm	mm
Mean	——	**2,22**	**1.38**

Group.	Eqke No.	Max. 2a of slow vibration.	Max. 2a of quick vibration.
		mm	mm
IV	160	0,56	0,66
	229	0,31	0,70
V	303	2,70	0,38
	309	0,16	0,25
	315	0,18	0,09
	320	0,05	0,02
	323	2,40	0,70
	330	0,24	0,18
	363	0,50	0,44
	368	0,18	0,14
VII	8	1,00	0,68
	69	0,43	0,40
	120	0,08	0,06
	366	0,08	0,03
VIII, A	119	0,13	0,13
	172	0,13	0,16
	177	0,80	1,03
VIII, B	144	0,44	0,56
	242	0,12	0,09
IX	85	0,24	0,48
	86	1,14	0,25
	113	0,13	0,16
		mm	mm
Mean.	——	**0,55**	**0,35**

From the above table, we get the following results, $2a'$ and $2a''$ denoting respectively the range of motion of the slow vibration and that of the quick one.

Groups II, III and VI (or earthquakes of comparatively distant origin):—

Mean $2a' = 2{,}22$ mm,
„ $2a'' = 1{,}38$ „
Ratio $\frac{2a'}{2a''} = 1{,}6.$

Groups IV, V, VII, VIII A, VIII B, and IX (or earthquakes of comparatively near origin):—

Mean $2a' = 0{,}55$ mm,
„ $2a'' = 0{,}35$ „
Ratio $\frac{2a'}{2a''} = 1{,}6.$

Thus it seems that in earthquakes of Groups II—1X, the slow period vibrations are on the whole about 1,6 times greater than the quick period ones.

§ 11. The following examples relate to the Tōkyō observations of three great earthquakes, whose origins were respectively off the north-eastern coast of the Main Island, in the province of Echigo, and off the eastern coast of the province of Kii.

(1). Eqke of April 23,1898; 8.37.00 a.m.:—

$2a' =$ about 23mm, $2a'' = 2{,}3$mm,

Ratio $\frac{2a'}{2a''} = 10.$

(2). Eqke of May 26,1898; 3.00.00 a.m.:—

(EW component) $2a' = 30$ mm, $2a'' = 6{,}1$ mm,

Ratio $\frac{2a'}{2a''} = 4{,}9.$

(NS component) $2a' = 13$ mm, $2a'' = 3{,}1$ mm,

Ratio $\frac{2a'}{2a''} = 4{,}2.$

(3). Eqke of March 7,1899; 9.55.29 a.m.:—

$$2a' = 16 \text{ mm}, \quad 2a'' = 1{,}2 \text{ mm},$$

$$\text{Ratio } \frac{2a'}{2a''} = 13.$$

The mean of the ratios $\frac{2a'}{2a''}$ is about 9. The distances of the centres of the above three earthquakes from Tōkyō were respectively 400, 140, and 390 km.

The probable conclusion is that, in great earthquakes, the slow period motion would be many times greater than the quick period one. Further, it is to be remembered that quick vibrations diminish much more rapidly than slow ones, as the seismic disturbances spread from the centre, owing to the viscosity of the material forming the earth's crust.

VII. Durations of the 1st and the 2nd Preliminary Tremors.

§ 12. The following table gives the durations of the 1st and 2nd preliminary tremors in the cases of 45 earthquakes observed at Hitotsubashi, in which these two introductory stages of motion were well demarked from each other.