

15. A Short Note on the Relation of Amplitude-Period of Earthquake Motion.

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From Figs. 5, 6 in the preceding paper¹⁾ and the observational results in Tokyo²⁾ and Fukui³⁾, the relation between the maximum acceleration of earthquake motion A_{\max} and the predominant period T_0 is obtained as shown in Fig. 1. From Fig. 1 the relation as the average becomes

$$A_{\max} \propto T_0^{-0.6 \pm 0.1}. \quad (1)$$

Then, as will be seen from the observation results of after-shocks in Nankai⁴⁾ and Fukui⁵⁾ earthquakes and compared results of observations made at two places in Tokyo and Hyōgo prefecture⁶⁾, the relation between the maximum displacement of earthquake motion D_{\max} and the predominant period T_0 becomes as shown in Fig. 2. Fig. 2 leads to the relation as the average which is

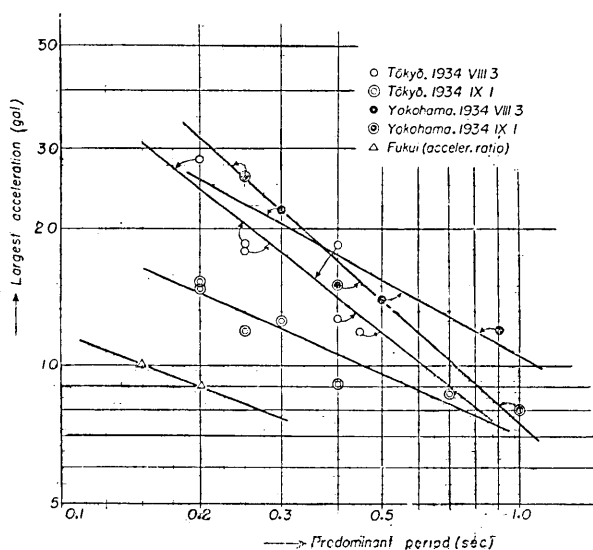


Fig. 1. Relation between the maximum acceleration of earthquake motion and the predominant period of ground.

- 1) K. KANAI and M. SUZUKI, *Bull. Earthq. Res. Inst.*, **32** (1954), 187.
- 2) M. ISHIMOTO, *Bull. Earthq. Res. Inst.*, **13** (1935), 594, Table II.
- 3) T. MINAKAMI, *Report of the Fukui Earthquake Committee* (1950), 84, Table 18.
- 4) T. MINAKAMI and S. SAKUMA, *Bull. Earthq. Res. Inst.*, **26** (1948), 63, Figs. 3, 4 and 64, Fig. 6.
- 5) T. MINAKAMI, *loc. cit.*, 3).
- 6) K. KANAI and T. SUZUKI, *Bull. Earthq. Res. Inst.*, **31** (1953), 312, Table IV, V.

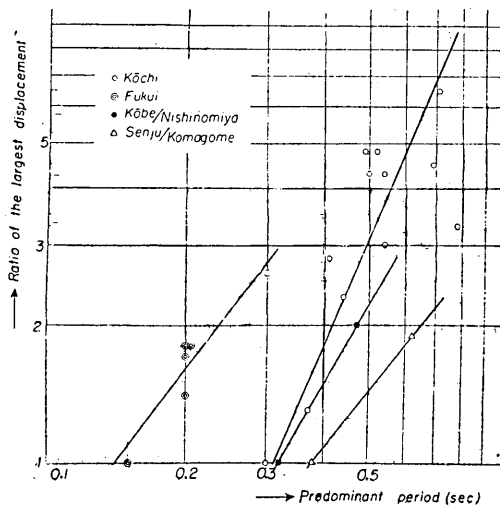


Fig. 2. Relation between the maximum displacement of earthquake motion and the predominant period of ground.

independent of the property of the ground⁷⁾. One of the explanations to this is that generally the vibrational impedance at ground surface tends to decrease and at the same time the effect of viscous damping decreases as the surface layer becomes thicker, and the maximum amplitude at ground surface becomes larger⁸⁾. Inversely, in a sense, the thicker the surface layer is, generally the number of layers of different vibrational impedance existing between the bed rock and the ground surface increases, and the maximum amplitude at the surface becomes smaller due to the coherency of waves⁹⁾.

These facts lead to a presumption that these two factors cancelling each other, $f(L)$ becomes almost independent of the property of ground. Consequently the relation between D , the amplitude at the bed rock, and T , the period of waves, may be represented as follows

$$D \propto T^{1.7 \pm 0.2}. \quad (4)$$

Concerning seismic waves, if the law of equipartition of energy holds good and seismic wave is affected by viscous damping in the course of

$$D_{\max} = T_0^{1.7 \pm 0.2}. \quad (2)$$

Now, let the wave amplitude at the bed rock be D and the maximum amplitude at the ground surface be D_{\max} . Then their relation is represented as follows;

$$\frac{D_{\max}}{D} = f(L), \quad (3)$$

where $f(L)$ is the coefficient depending on both the material existing between the bed rock and the ground surface and the geological formation. According to the observational results of earthquake, it is known that D_{\max}/D is almost

7) K. KANAI, K. OSADA and S. YOSHIKAWA, *Bull. Earthq. Res. Inst.*, **31** (1953), 229, Fig. 6 and 230, Fig. 7.

8) K. KANAI, *Bull. Earthq. Res. Inst.*, **30** (1952), 35.

9) K. KANAI and S. YOSHIKAWA, *Bull. Earthq. Res. Inst.*, **31** (1953), 275.

transmission, the relation represented by equation (4) is acceptable so far as it goes.

In conclusion the author wishes to express his thanks to Miss S. Yoshizawa who assisted him in preparing this paper.

15. 地震動の振幅と周期との関係 (小引)

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東京, 横浜, 福井の各種の地盤で, 周期 0.1 sec の地震計を使つて, 地震の比較観測を行つて得られた結果から, ある基準地の最大加速度に対する各地の最大加速度の割合と夫々の土地の卓越周期との関係を求めると,

$$A_{\max} \propto T_0^{-0.6 \pm 0.1} \quad (1)$$

となつた.

又, 高知, 福井, 東京, 兵庫の各種の地盤で, 周期 1 sec の地震計を使つて地震の比較観測を行つて得られた結果から, ある基準地の最大変位に対する各地の最大変位の割合と夫々の土地の卓越周期の間には次の関係があることになつた.

$$D_{\max} \propto T_0^{1.7 \pm 0.2} \quad (2)$$

(1), (2) 式を使つて, 地震波の性質, 地盤係数についての議論を行つた.
