

A New Approach for Combining Simple Soil Investigation and Wide-Area Ground Response Analysis

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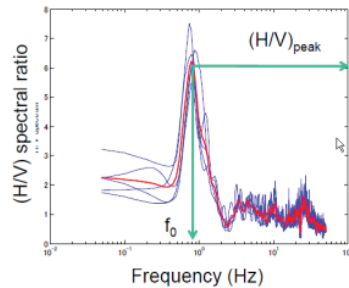


Fig.1 H/V spectral ratio

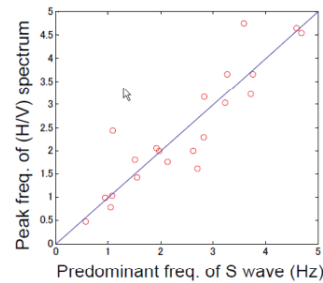
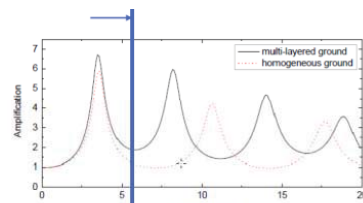
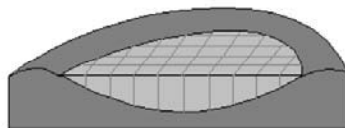


Fig.2 $\frac{1}{4}$ wavelength rule

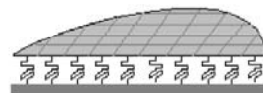


← Fig.3 Site response by equivalent model

↓ Fig.4 Quasi-Three-Dimensional model

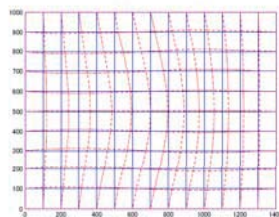


Irregularly-bounded 3D ground



Two dimensional plane supported by springs

3D FEM (0.7618Hz)



Q3DGM (0.8608Hz)

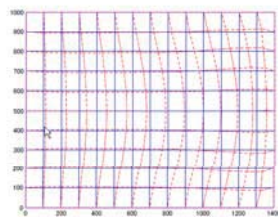


Fig.5 Comparison of simplified model with FEM

Content:

This study proposes a method of combining simple soil investigation with microtremor measurement and simple ground response analysis. From the microtremor measurements conducted only on a ground surface, horizontal to vertical spectral ratios are calculated (Fig.1), accordingly predominant frequencies are evaluated in a wide area (Fig.2). Using these results while assuming the depths of the bedrock are known, a multi-layered soil deposit is replaced with an equivalent homogeneous ground that has the identical fundamental frequency underlain by bedrock. Showing that the simple soil model is suitable to be used in the low frequency range (Fig.3), the soil is attributed to further simplified soil model (Fig.4, Quasi-Three-Dimensional-Ground Model). Similar computational results are obtained for the dynamic analysis of multi-layered, irregular-shaped ground model between the proposed method and three dimensional finite element method (Fig.5). Hence, the proposed approach may be rational and cost effective when ground response analysis needs to be applied to a wide area.

Keywords: H/V spectral ratio, simplified ground model

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