Simulation of Ground Motion Using the Stochastic Method for Taipei Basin Response

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Abstract

The stochastic method is a simple and powerful method for simulating ground motions. This method combines the parameters of the ground motion's amplitude spectrum with a random phase spectrum. The ground motion is distributed over a duration related to the earthquake magnitude and the distance from the source. Fourier-amplitude spectrum (FAS) is one of the most important parameters describing earthquake ground motion. It is widely used for strong ground motion prediction and seismic hazard estimation. Response spectra for condition of rock sites were calculated using stochastic simulation method and obtained models of source spectra.

The response of Taipei basin was studied using records of recent earthquake. In this study, the strong-motion database obtained from 32 stations of the Taipei TSMIP network from 83 deep and 142 shallow earthquakes (M > 4) occurred in 1992-2004. The characteristics of frequency-dependent site response were obtained as spectral ratios between the real earthquake records and the modelled for a hypothetical Very Hard Rock (VHR) condition. Analysis of site response characteristics and comparison with simple 1D models of the soil column resulted : (1) The spectral ratios throughout the basin obtained from deep earthquakes (depth > 35 km) exhibit good agreement with the theoretical ratios. (2) The spectral ratios obtained from shallow earthquakes show influence of (a) surface waves generated from distant source to the basin and (b) relatively low-frequency (< 1-2 Hz) waves generated within the basin. (3) Some shallow earthquake produce high amplification at frequencies 0.3-1 Hz within the basin.

Keywords : Stochastic simulation, Fourier-amplitude spectrum, Taipei Basin, Deep and shallow earthquakes

References

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