P-34

Stochastic Green's Function Technique with Phase Dependent Site Response

O Gülüm Birgören, Kojiro Irikura

This study discusses the improvement of strong ground motion simulation at basin sites with the Stochastic Green's Function Simulation Method using an empirical site response estimation technique. Traditional approaches to calculating site responses in places underlain by sedimentary layers do not effectively take into account the phase properties of a seismic signal. However, the phase part of the signal keeping arrival times of seismic waves becomes essential when the basin induced waves are considered. It is well known that extended duration of ground motion is associated with the damage in flexible structures at the sites underlain by deep basins.

The site response estimation technique presented here focuses on the calculation of the site response at basin stations taking into consideration the elongation of the ground motion due to basin effects and follows a simple empirical method using the Meyer-Yamada wavelet procedure for the phase dependent site response estimation in time domain. Since, the method estimates the site response at a station directly from its time domain data by removing source and path effects at each wavelet level, the phase information is automatically kept in the analysis. The method is particularly useful for the simulation of the extended duration of the earthquake motion more realistically at regions whose velocity structure information is limited.

An application of the site response estimation technique has been performed using the aftershock data set of the 1999 Düzce, Turkey Earthquake recorded at observation stations inside and outside of the Düzce Basin. First, a spectral calculation method of site response has been introduced and amplitude spectra of the absolute site responses were estimated at each station. Second, the site responses in time domain were calculated by the wavelet method and the results for basin stations and hard soil stations were compared.

Generation of the Stochastic Green's Functions by convolving the source acceleration time history with site response time history and consequently, the mainshock simulation of the 1999 Düzce, Turkey Earthquake (Mw: 7.1) by summation technique with a characterized source model and phase dependent site response have been carried out for broad frequency range at selected stations. The observed and synthesized ground motions are highly compatible, which reflects the efficiency of the method.