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Site correction of stochastic simulation in southwestern Taiwan

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Peak ground acceleration (PGA) of a disastrous earthquake, is concerned both in civil engineering and seismology study. Presently, the ground motion prediction equation is widely used for PGA estimation study by engineers. However, the local site effect is another important factor participates in strong motion prediction. For example, in 1985 the Mexico City, 400km far from the epicenter, suffered massive damage due to the seismic wave amplification from the local alluvial layers. (Anderson et al., 1986)

In past studies, the use of stochastic method had been done and showed well performance on the simulation of ground-motion at rock site (Beresnev and Atkinson, 1998a ; Roumelioti and Beresnev, 2003). In this study, the site correction was conducted by the empirical transfer function compared with the rock site response from stochastic point-source (Boore, 2005) and finite-fault (Boore, 2009) methods. The error between the simulated and observed Fourier spectrum and PGA are calculated. Further we compared the estimated PGA to the result calculated from ground motion prediction equation.

The earthquake data used in this study is recorded by Taiwan Strong Motion Instrumentation Program (TSMIP) from 1991 to 2012; the study area is located at south-western Taiwan. The empirical transfer function was generated by calculating the spectrum ratio between alluvial site and rock site (Borcheret, 1970). Due to the lack of reference rock site station in this area, the rock site ground motion was generated through stochastic point-source model instead. Several target events were then chosen for stochastic point-source simulating to the halfspace. Then, the empirical transfer function for each station was multiplied to the simulated halfspace response.

Finally, we focused on two target events: the 1999 Chi-Chi earthquake (Mw=7.6) and the 2010 Jiashian earthquake (Mw=6.4). Considering the large event may contain with complex rupture mechanism, the asperity and delay time for each sub-fault is to be concerned. Both the stochastic point-source and the finite-fault model were used to check the result of our correction.