Geophysical Research Abstracts
Vol. 21, EGU2019-9489, 2019
EGU General Assembly 2019

Stochastic ground motion simulation considering soil nonlinearity using equivalent linear method: A practice of the LSST array

Cin-Yu Lin (1), Jyun-Yan Huang (2), Kuo-Liang Wen (1,2)

(1) National Central University, Institute of Geophysics, Taoyuan, Taiwan , (2) National Center for Research on Earthquake Engineering, Taipei, Taiwan

Ground motion prediction is widely accepted in seismic hazard studies. Ground motion simulations are conducted by combining stochastic method and one-dimensional equivalent-linear method in this study. Stochastic ground motion simulation technique can effectively consider the source, path and site effect, which depends on physical-based seismological knowledge. Site effect involves the propagation of earthquake motions from the bedrock, passing through the overlying soil layers to the ground surface. The variations of local site conditions have different characteristics of the earthquake motions; so it is important to consider such effect for site correction in any simulation method. Frequency domain equivalent linear analysis is one of the most common approaches used for performing one-dimensional site response analysis and produce nonlinear soil response as well.

Thus, numerical modeling of site response program, SHAKE, is used to carry out the soil nonlinearity problem in this study. Firstly, seismic data from the Large Scale Seismic Test (LSST) array in Lotung, Taiwan are checked with one-dimensional simulations. Secondly, stochastic ground motion simulation is performed and verified to obtain simulated accelerograms at a rock site. Then these accelerograms are regard as the input motions for equivalent-linear method to obtain simulated accelerograms at soil surface of LSST array. Finally, site correction is performed using outcrop input motions at different depths to identify quantitatively simulation errors. When comparing the response spectrum and the peak ground acceleration to the reality, results seem to be the overall good approximation. But the approximation to the reality for the results of the waveforms is poor due to random phase from stochastic simulation technique. And all the results also show that site effects have major influence in structural analysis.