

A study of topographic effects by simulation

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Earthquake ground motions are complex and have different characteristics on different topographic surfaces. Generally, they are larger at mountain top than what at foot hill. This phenomenon is called topographic effects. Topographic effects may be frequency-dependent. However, in practice, it is quite difficult to be analyzed and isolated due to both the complexity of topography and strong ground motions. In this research, we are going to perform a simulation study and hope the results will be helpful for formulating ground motion prediction equations in the future.

First of all, in this study, we simulate strong ground motions recorded at several different mountain surfaces by finite element method (FEM). Accordingly, the response spectra are also calculated. Then, each hypothetic topographic relief is treated as a space wave. The corresponding elevation model is narrow-band filtered with different center wave numbers. The new elevation measured on the filtered terrain can be made as an index for topographic effect. Based on this concept, we introduce a new methodology to predict topographic effect of strong ground motion. The topographic-effect index for particular center wave number is compared with simulated response spectrum at corresponding natural period. The result shows that the proposed methodology is worth for further study.