

Effects of random heterogeneity in the crust on long-period ground-motion simulations in Kanto area

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Effects of the random heterogeneity of the crustal structure on the predicted ground motion at periods of 1 s and longer are investigated by conducting three-dimensional finite-difference simulations using a detailed realistic velocity model of Kanto area, Japan. Random heterogeneity of the media within the upper crust was modeled using the correlation function with Exponential-type power spectrum where the standard deviation is set to 5 %. Combinations of the heterogeneous media with different correlation lengths and the point source model with different depth and durations were considered to study the variability of the predicted ground motions and the sensitivity to the tested parameters. Ground motion variability, in terms of peak ground velocity and velocity response spectra, was evaluated by using the residual between the ground motion computed with and without random heterogeneity. While the residual averaged over the surface of the computed area is almost negligible in the studied period range, the standard deviation was approximately 0.2 –0.3 in natural log units at periods of 1 –2 s. Standard deviation was found to increase with hypocentral distance, and to be larger for the point source with shorter duration.

Keywords: long-period ground motion, random heterogeneous media, ground-motion variability, Kanto area