Long-period ground motion hazard map of Sagami-Trough earthquakes

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We simulate long-period ground motions associated with great earthquakes in the Sagami Trough by the finite difference method using a characterized source model and a 3-D velocity structure model. Parameters of the characterized source model are determined based on a "recipe" for predicting strong ground motion (Earthquake Research Committee, 2009). We construct 288 source models for hypothetical Genroku (M_W8.4-8.5) earthquake and 120 models for hypothetical Taisho (M_W7.9-8.0) earthquake assuming possible source parameters, including asperity configuration, asperity size and rupture starting point; the 1703 Genroku earthquake and the 1923 Taisho earthquake are great earthquakes in the Sagami Trough and recognized as the Kanto earthquake. Then we apply a multi-scale heterogeneity (Sekiguchi and Yoshimi, 2006) to the rupture velocity, slip, and rake angle of the characterized source models. We use a recently constructing 3-D velocity structure model for the Kanto area in the simulation. An analyzing period range of our simulation is over 2 s.

Spatial distribution maps of simulated velocity response spectra (Sv) indicate that the rupture starting point has large impact on the distribution. Because the source area is located beneath the Kanto plane, body waves have large amplitude in simulated waveforms. Histogram of Sv shows a log-normal like distribution. We evaluate average and standard deviation (SD) of Sv for two types of Kanto earthquake. For the Taisho-type earthquake, most areas have smaller Sv value than 100cm/s in the average maps and some areas exceed 150cm/s in the average + SD maps. For the Genroku-type earthquake, some areas exceed 150cm/s in the average maps and 200cm/s in the average + SD maps. In this study, we treat two earthquakes individually. However, the variability is expected for the occurrence pattern of great earthquake in the Sagami Trough. It is important to study long-period ground-motion hazard for great earthquakes in the Sagami Trough by accumulating a simulation result using the variability of source area.

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References

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