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Broadband ground motion simulation for great earthquakes along Sagami Trough

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Possible scenarios of great earthquakes along Sagami trough are modeled combining characteristic properties of the source area and adequate variation in source parameters in order to evaluate possible ground motion variation due to next Kanto earthquake.

We assume the rupture area of 1703 Genroku Kanto earthquake as the possible largest rupture area which consists of three fault segments. On the segment which also ruptured during the 1923 Taisho Kanto earthquake, we assume two sticking asperities which are derived commonly among source inversion analyses of this earthquake.

We construct many earthquake scenarios varying extent of the rupture area, the average stress drop, the average rupture velocity, hypocenter location and random heterogeneity of the source parameters with scale smaller than asperities. Variations of the average stress drop and the average rupture velocity are estimated from the variations of these values among the source models of past earthquakes.

The ground motions are computed with a four-step hybrid technique. We first calculate low-frequency ground motions at the engineering basement, which in this study is taken to be the depth at which the S-wave velocity exceeds 0.5 km/s. We then calculate higher-frequency ground motions at the same position, and combine the lower- and higher-frequency motions using a matched filter. We finally calculate ground motions at the surface by computing the response of the alluvium-diluvium layers to the combined motions at the engineering basement.

A comparison of ground motion distributions in the Kanto basin from the various earthquake scenarios suggests that source parameters which largely change the ground motion level in the wide are relocation of hypocenter and the average stress drop.

Keywords: ground motion prediction, Kanto earthquake, interplate earthquake, asperity, variation of parameter