# Ground motion prediction and results utilization for next Tokyo metropolitan earthquakes

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In the Tokyo metropolitan area and its vicinity (almost equivalent to the southern Kanto region), magnitude (M) 8 plate boundary earthquakes, such as the 1923 Taisho Kanto earthquake and the 1703 Genroku Kanto earthquake, occur every 200 years or so. In addition, large earthquakes with magnitudes of 7 occur even during a quiet period of 200 years between neighboring M8 earthquakes or, in particular, its later half of 100 years, causing severe damage to Edo (ancient Tokyo) or Tokyo. These M7 events are called 'Tokyo metropolitan earthquakes.' It is thought that five Tokyo metropolitan earthquakes occurred in the Meiji era for which more documents are available compared with previous eras. Based on this acknowledgement, the Earthquake Research Committee of the Japanese government announced that the long-term probability of the occurrence of a Tokyo metropolitan earthquake within 30 years from the present was evaluated to be about 70%.

In this study, referring to Sakai (2010), we first choose a few Tokyo metropolitan earthquakes with a large occurrence probability and potential influence to the Tokyo metropolitan area. We then make their source models using the recipe of Irikura and Miyake (2011) or other. However, this kind of recipe is mostly for crustal earthquakes (shallow inland earthquakes), though Tokyo metropolitan earthquakes are rather deep plate-boundary or in-slab earthquakes with depths of several tens km. Some parameters and equations in the recipes should be revised accordingly. We then have to make a velocity structure model for the southern Kanto region using the recipe of Koketsu et al. (2009) or other, but we have already constructed the first-grade model (model improved using seismic records) of this region for the long-period ground motion hazard maps 2009. Therefore, we use this model with minimum revisions.

We carry out ground motion simulations for long-period components, compute short-period components by the stochastic Green's function method, and then hybidly combine them into broadband ground motions with a matching period of 2 to 3 s. These results are time-domain waveforms predicted on the engineering bedrock at various sites in the Tokyo metropolitan area. Their response spectra are also provided for the utilization in the fields of engineering and others. In addition, based on our experiences of the long-period ground motion hazard maps, we also make distribution maps of peak ground velocities, seismic intensities, duration time, response spectra at various periods, and so on for further utilization in these fields.

Keywords: Tokyo metropolitan earthquakes, ground motion prediction, results utilization