

The Daidaitoku community model of the velocity structure beneath the Tokyo metropolitan area (1)

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We are carrying out the construction of the community velocity model in the Tokyo metropolitan area under the Special Project for Earthquake Disaster Mitigation in Urban Area (Daidaitoku Project) in order to upgrade strong ground motion prediction. Several models have been proposed using refraction/reflection, borehole, microtremor, and gravity data by Koketsu and Higashi (1992), Yamanaka and Yamada (2002), Afnimar et al. (2003) and so on. The refraction survey lines were distributed mainly in the central part of the Kanto basin by the Research Group on Underground Structure in the Tokyo Metropolitan Area and other institutions, but there were few stations in areas such as the southwestern part of the basin and the Boso peninsula, so the accuracy of the model in these areas was not adequate.

In 2002 and 2003 the Daidaitoku project conducted large-scale reflection surveys along the Boso, Tokyo Bay, Sagami and Kanto West lines. Many refraction data were also obtained during these surveys, so that the areas are now covered with the survey lines. In order to clarify the structure in the areas and construct a revised model, we estimated the velocity structure by the refraction/gravity joint inversion method (Afnimar et al., 2002) with refraction data including these new data and gravity data in the whole Kanto basin. We have constructed the structures of the three sediment layers (Shimosa, Kazusa and Miura layers) and the basement by determining the depths of Kazusa/Miura and sediment/basement interfaces and the basement velocity distribution. We obtained the result with the minimum residuals of travel times and gravity data. Our model has thicker sediment layers in the Boso peninsula with the deepest point of over 4.5km than those in the other structure models. It has slightly thinner layers of 1.5km - 2km around the Sagami Bay-Odawara area and those of 2.5km - 3km in the western part of Tokyo.

We then adopted this model as an initial model for the further adjustment of the velocity structure. We used records of 27 earthquakes in 2000 to 2004 with magnitudes equal to or greater than 6.5 observed at K-NET stations in the Kanto region. We first picked S-wave arrivals and calculated the spectral ratios of horizontal and vertical motions (H/V spectra). The structure model was adjusted in such a way that the theoretical H/V spectra for the Rayleigh waves got closer to the observed H/V spectra. The depth of the basement was fixed and the ratios of the layer thicknesses were preserved during the adjustments. The adjusted model includes low-velocity sediments thicker than 1000m as well as the deep basement in the central part of the Chiba prefecture.