CONSTRUCTION OF SHALLOW AND DEEP LAYERS COMBINED MODEL IN THE KANTO REGION, JAPAN

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The Earthquake Research Committee, the Headquarters for Earthquake Research Promotion (ERC/HERP) keeps updated "National Seismic Hazard Maps for Japan" consisting of two types of maps: probabilistic seismic hazard maps, and scenario-based ground motion maps. The latter requires a three-dimensional velocity structure model involving density, P- and S-wave velocities, Q-values, and the boundary shapes for each layer. Conventional nation-wide velocity models ERC used (e.g., Koketsu et al., 2008) have been only deep sedimentary layers by which accuracy of broadband ground motion is limited. For improving reliability of the seismic ground motion prediction, ERC newly applied the procedures to develop 3D models of shallow soil layers with S-wave velocity less than 350 m/s over engineering bedrock with S-wave velocities of 350-700 m/s and deep sedimentary layers having S-wave velocities from 350 to 3,000m/s over the seismic basement with an S-wave velocity of about 3 km/s for the shallow and deep layers combined model (SDLCM in the following). So far, ERC published “Procedures to establish a subsurface structure model” and established a new SDLCM for the Kanto region, Japan. This paper shows characteristics of the shallow and deep layers combined model constructed in the Kanto region.

One of advantages of application of SDLCM to seismic hazard maps is that amplification factors of ground motion on the surface to that in the seismic basement can directly be obtained at every grid point of the SDLCM. The new distribution of amplification factors by SDLCM shows a more complex spatial variation of the Vs30s than ones by geomorpholgical classification which was applied in the previous method. In particular much low Vs30s are identified in the new map along the major rivers. We furthermore calculate amplification factors of PGV between the surface and the top of the engineering bedrock using the two maps of the Vs30s. As comparing the amplification factors by SDLCM and by the previous method, it is noted that the amplification factors are calculated using the same empirical equation of a Vs30 from different Vs30s and the S-wave velocities of the engineering bedrock of the two models. The variation of the amplification factors for the new model is much wider than that of the previous one. In particular the amplification factors for the two types of the terraces are so large in the new model of SDLCM. Thus, it’s concluded that the new SDLCM for Kanto region, Japan can be used for a reliable seismic ground motion prediction for future large events.

Keywords: Shallow soil, Deep sediments, S-wave velocity, Ground motion prediction, 3D velocity structure, Average S-wave velocity

