Subsurface soil structure model for the strong-motion prediction in the Osaka basin

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We developed a soil model in the Osaka basin and investigated non-linear soil parameters, as a part of the ground motion prediction project conducted in AFRC, GSJ/AIST.

The soil structural model of layer structure and material properties between the surface and the layer of Vs = 300-350 m/s, around DG1 layer is constructed for each 500 m square mesh. Material properties (N-value and p0) and soil types are derived from more than 30,000 borehole data in the Osaka basin.

To supply S-wave velocities of the layers at the mesh without any mesured velocity data, estimating equations among Vs, N-value, pressure for each soil type are made from PS-logged borehole data. In the most of the mesh, measured velocity data is not existed. Velocity model of the subsurface soil layer is made from geological and N-value data for each mesh. To examin the estimating equation, we compare the velocity structure from real PS-logging data and the estimation from the equation. Result of the comparison shows the difference of the two is very little and it means that the equation is believed to be useful for assigning velocities of the model.

Non-linear soil properties for evalutation of the non-linear seismic behavior have been introduced from previous studies about laboratory experiment and examined by the observed record during 1995 Kobe earthquake. Hardin-Drnevich model is used as strain-dependency of modulus model and equivalent linear method (DYNEQ, YOSHIDA, 1995) is used for seismic response calculation. Examinations of the introduced non-linear soil properties based on the observed strong-motion records are carried out and the result indicates that the predictions by the equivalent linear method good fit the observed data.