Modeling of the subsurface structure from the seismic bedrock to the ground surface for a broadband strong motion evaluation in Kanto Area. (part2)

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We have collected a lot of boring exploration and physical property data (mainly microtremor observation ones) in the past, which are important to especially evaluate seismic ground motion in period range from 0.5 s to 2.0 s, and have studied combining a shallow part with a deep one on a subsurface structure model, for the purpose of modeling subsurface structure so that we can evaluate broadband earthquake ground motion from 0.1 Hz to 10 Hz. In this paper, we will report the methods of modeling initial subsurface structure and S-wave velocity structure which incorporate period and amplification characteristics based on earthquake and microtremor observation records, in the whole area of Kanto including Tokyo, Japan.

In this research, initial geological models were developed and then subsurface structure models from seismic bedrock to ground surface were constructed by using records of earthquake observation and microtremor array observation. These models in Kanto area were improved in terms of broadband period characteristics in comparison with the previous integrated models. In addition, about computation with 1D multiple reflection method executed separately, the results were considerably improved in the vicinity of period 1 s which was important from the standpoint of disaster prevention. It can result from not only detailed modeling of shallow subsurface structure by collecting soil columns data, but also improvement of models by evaluating phase velocity and H/V spectral ratio based on microtremor observation, for the structure around engineering bedrock from Vs300 m/s to Vs500 m/s which were boundary layers between shallow and deep subsurface structure.

There are a number of problems in terms of model quality variability by region due to collection density of boring data at the time of development of initial geological models. But the method, which has using miniature array observation etc. and modifying the depth of engineering bedrock surface with geological information, can enable an S-wave velocity model to be stably improved around engineering bedrock in any region. In the near future, we will develop subsurface structure models in Tokai area and all over Japan.

Keywords: Strong motion evaluation, S-wave velocity structure model, Microtremor array, Borehole data

