Modeling technique of underground structure and numerical simulation in strong-motion mapping project

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The National Research Institute for Earth Science and Disaster Prevention (NIED) has promoted the research project 'Research on strong-motion mapping of Japan' to support the national strong-motion mapping project promoted by the Earthquake Research Committee of the Headquarters for Earthquake Research Promotion. In this study, we look back the trace of the project to clear the problems that we must settle in the future.

The national strong-motion map consists of scenario earthquake maps and earthquake hazard maps. For the scenario earthquake mapping, we make characteristic source models and underground structure models to calculate seismic wave fields. Although shape and location of asperities and start point of the rupture are unsettled problems, the recipe to set the parameters for the characteristic source model has been established.

On the other hand, the standard method to model underground structure has not been established. In our project, we had to adopt different modeling methods depend on the quality and quantity of the information on underground structures. It is desired to establish the optimized method under the limited research resources.

To estimate the amplification of near ground surface is also important problems.In the project, near surface site effects are estimated by using method of Matsuoka and Midorikawa (1994). In restricted regions, surface amplification is investigated for the seismic velocity models based on boring data. More systematic approach will be required to cover whole area of Japan.

Standardization for methods of numerical simulation of seismic wave propagation is necessary. Toward the standardization, we have to settle problems, such as, to estimate numerical error in simulation methods and to propose the standard format for grid data of underground structures.