Japan Geoscience Union Meeting 2011
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HDS028-P01 Room:Convention Hall Time:May 24 16:15-18:45

Selection of scenario earthquakes based on the national seismic hazard maps for Japan

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The seismic damage assessment is a basic document of earthquake disaster prevention measures, and the selection of the scenario earthquake is an important problem to examine earthquake disaster prevention measures. The scenario earthquake is selected by seismic activity in an object area and the circumference, and by the degree of the effect on the object area. But, the judgment reason has left the considerable ambiguity. In late years, seismic hazard map covering all over Japan (the national seismic hazard maps for Japan) is announced by the Headquarters for Earthquake Research Promotion. The national seismic hazard maps of Japan consists of ”probabilistic seismic hazard maps” and ”scenario earthquake shaking maps”. In addition, the earthquakes are classified in three earthquake categories according to the characteristic. By utilizing this information, it can be expected that the rational selection of the scenario earthquake becomes possible. Then, in this study, for the purpose of supporting seismic damage assessment of local government, it was examined the selection method of the scenario earthquake by considering seismic risk based on the national seismic hazard map for Japan, it was examined.

In this study, the earthquake which affect the object area considering seismic risk estimated by simple technique, was classified into the earthquake which should have dealt right now, the earthquake which should prepare for, and the earthquake which did not need to prepare for now. In addition, the earthquakes that should prepare for were classified in the large-scale damage and the middle scale damage. This is so that demanded disaster prevention measures are different from the large-scale damage (a wide area and the serious damage) in the middle scale damage (the damage to be concentrated in the weak area). And, the damage forms are different by the earthquake characteristics (occurrence frequency, spectrum and duration of ground motion). According to the earthquake category used with the national seismic hazard map for Japan, the classification mentioned above was applied. In the Fujisawa City that carries out the cooperative research with National Research Institute for Earth Science and Disaster Prevention (NIED), the earthquake was classified using seismic activity model of national seismic hazard maps.

The future problem is to determine the procedure of parameter setting for strong ground motion for the selected scenario earthquake. Especially, the quantification of the indeterminateness in strong motion prediction recipe, and the standardization of the procedure of the parameter setting based on quantified indeterminateness are problems. The selecting method of the scenario earthquake is a decision-making problem, and cooperation with the decision-maker is indispensable. Therefore, the research will be advanced on selecting method of the scenario earthquake through the cooperative research with the Fujisawa City.

Keywords: seicmic hazard map, selecting method of scenario earthquake, earthquake risk, earthquake category

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Development of estimation system for earthquake ground motion by ”Scenario earthquake shaking map”

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Recently, the number of analysis cases has increased according to the earthquake ground motion estimation of a local government and national projects,etc. However, it is not in the situation in which the earthquake ground motion estimation results can be examined enough in still a lot of laboratories and private companies. In this study, the tools are development for the efficiency improvement of the setting though the system that calculates the earthquake ground motion estimation and the earthquake ground motion by the distance attenuation relationship system (1) and the hybrid method system (2) and the interoperability system using Cloud technology (3) is being developed by NIED as for it. The process of the investigation can be shortened in using the above-mentioned system. It was executed for (1) ,(2) and (3) that had been shown about the development of an easy, comprehensible GUI tool in this research material. As for the interoperability system using the Cloud technology, it is scheduled to examine it in the future.

Keywords: Scenario earthquake shaking map, Attenuation Relations, GUI, Cloud computing, Interoperability

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Estimation of S-wave velocity structure of deep sedimentary layer around Lake Biwa using earthquake ground motion record

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We construct the 3D subsurface structural model using the data of geophysical and geological surveys in and around Lake Biwa. And we have modified the model using the S-wave parts of earthquake records, H/V spectral ratio of S-coda and phase velocity of microtremor. In the waveform inversion of S-wave, we assume a simple source time function and plane wave incident to a layered model from the basement.

Using 3D subsurface structural models, we simulate ground motions for moderate earthquakes. The first model is the model using only boring and reflection survey data; the second one is the model by adjusting the peak period of theoretical H/V spectral ratio to observed one; the last one is the model by joint inversion of S-wave, H/V spectra and phase velocity of microtremor. As the results, simulated waveforms of ground velocity by using joint inversion model agree with observed ones better. It is possible to construct 3D subsurface structural model which is applicable to strong motion simulation by using earthquake ground motion records, even though there are few data of geophysical surveys.

Keywords: Finite Difference Method, phase velocity, S-wave, horizontal-to-vertical spectra, Joint inversion

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Estimation of Q in a deep subsurface structure modeling for broadband ground motion prediction

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It is important for broadband earthquake simulation to estimate Q of a deep subsurface structure model considering a different characteristic between long (surface wave) and short period (body wave) motion. In a deep subsurface structure modeling for long period ground motion simulation, Q is mainly determined from numerical modeling by 3D simulation of long period ground motion. For short period ground motion simulation, Q is determined from inversion by assuming 1D wave propagation theory fitting to a transfer function from vertical array data or a site amplification factor from the spectral inversion technique.

Recently we showed that the effect of introducing random fluctuation of S-wave velocity to a deep subsurface structure model on short period site amplification is similar to the effect of adjusting Q (adding damping factor) in the Niigata plain, Japan.

In this study, we estimate the statistical property of random fluctuation by fitting to von Karman type autocorrelation function using digitized log data of sedimentary layer in the Kanto plain. In the logging station, Q of sedimentary layer is also estimated from the inversion of transfer function using the borehole data by KiK-net (NIED). We, therefore, demonstrate the relationship between the Q of deep sedimentary layer and the strength of random fluctuation from log data.

Keywords: attenuation, deep subsurface structural model, random fluctuation of velocity, log data, borehole array observation