Verification of Methodology for Predicting Strong Ground Motion Based on Characterized Source Model –Learning from Recent Disastrous Earthquakes in Japan-

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ABSTRACT

Slip heterogeneities inside rupture areas of large earthquakes have been found from the results of the waveform inversion using strong motion data. Destructive ground motions including short-period components are generated from such heterogeneities. Asperities are defined as areas with large slip based on slip distributions from the waveform inversion. We confirmed that the areas generating strong ground motions coincide with the asperities mentioned above. Then, we define a characterized source model with asperities in an entire rupture area for simulating strong ground motions. We found that ground motions from recent inland-crust earthquakes are well simulated using the characterized source model. Then we developed a "recipe" to construct the characterized source model for predicting strong ground motions. This recipe gives source modeling for earthquakes caused to specific active faults obtained from geological, geo-morphological surveys and geophysical investigations and two kinds of the scaling relationships for the fault parameters. The verification and applicability of the procedures for characterizing the earthquake sources for strong ground prediction are examined in comparison with the observed records and broad-band simulated motions for recent disastrous inland earthquakes. We show a case of the 2007 Niigata-ken Chuetsu-oki earthquake as one of examples. This earthquake occurred very close to the Kashiwazaki-Kariwa Nuclear Power Plant. Ground motions from this earthquake are well simulated based on the characterized source model. We find that the "recipe" based on the idea of characterized source model is useful for predicting ground motions for earthquake safety designs as long as the source faults and the fault parameters are correctly specified through investigation of active folds and faults.

Key words: strong motion prediction, characterized source model, asperity, active fault, 2007 Chuetsu-oki earthquake.