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Modeling 3D Velocity Structure in the Fault Region of the 2007 Niigataken Chuetu-oki Earthquake with Folding Structure

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Introduction

The large ground motions were observed at the Kashiwazaki-Kariwa Nuclear Power Plant (KKNP) for the 2007 Niigataken Chuetsu-Oki earthquake (M6.8). This earthquake produced the large ground motion variations even in the narrow area such as inside the KKNP site. Previous studies, such as Tokumitsu et al. (2009), reported that this ground motion variation might come from the folding structure light below the site. This indicates that the folding structure is necessary to be considered for ground motion prediction. In this study, we have constructed the velocity model including the folding structure and validated it based on the simulation for moderate sized event.

Construction of Velocity Model

The velocity model developed including broad Chuetu area by Japan Nuclear Energy Safety Organization (JNES) (JNES, 2008) has been used as the basic model. The folding structure developed by Tokumitsu et al. (2009) is built into the broad model. We connected smoothly those two models to eliminate the artificial waves generated on the boundary area. We picked three events for the model validation. Two comes from the aftershocks of Chuetsu-Oki earthquake and the other comes from the aftershock of 2004 Chuetsu earthquake.

We could reproduce the general feature of ground motions at the KKNP site by the simulation for moderate sized events. The ground motion level was larger for south side of KKNP site than it for north side of KKNP site. These results suggest that the folding structure played an important role for ground motion during the main shock of Chuetsu-Oki event.

Summary

We have constructed the velocity model including the folding structure. We could reproduce the general features of ground motion by the simulation for moderate sized events. The results of simulation indicate that the folding structure played an important role during the main shock of Chuetsu-Oki earthquake.

Keywords: 2007 Niigataken Chuetsu-oki Earthquake, Kashiwazaki-Kariwa Nuclear Power Plant, 3D velocity model, Fold, ground motion simulation