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Uncertainty of Kinematic Source Inversion Solution by Resampling Test in Case of the 2007 Noto Hanto Earthquake

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Kinematic source inversion using strong motion and GPS data gives detailed image of the heterogeneous source rupture process during large earthquakes. The obtained source models have been used to discuss the relationship between the heterogeneous rupture process and the near-source strong ground motions and to develop the strong motion prediction technique based on the recipe (e.g., Iwata, 2009). However, there are critical discussion on the stability and reliability of the kinematic source inversion results, and an international project for source inversion validation was launched (e.g., Mai *et al.*, 2010). In this study, we analyze the stability and uncertainty of the kinematic source inversion solution by bootstrap approach suing the data set for the 2007 Noto Hanto earthquake.

As for the 2007 Noto Hanto earthquake, we have already obtained the source rupture process by the multiple time-window linear waveform inversion method (Hartzell and Heaton, 1983) using the velocity waveform data at 12 strong motion stations of K-NET and KiK-net (0.05-1 Hz) and the horizontal static offset measured at 19 GPS stations of GEONET (Asano and Iwata, 2007). The one-dimensional velocity structure models for strong motion stations were optimized by the aftershock's waveform modeling. The relative weight between strong motion and GPS data and the smoothing strength were objectively determined by minimizing ABIC.

In this study, we generated 1000 data sets by randomly removing three strong motion stations and four GPS stations from the original data set. From 1000 solutions, we calculated the averages, standard deviations, and the coefficients of variation of the total seismic moment and the slip amount at each subfault. The average total seismic moment is 1.64×10^{19}Nm and average maximum slip is 4.8 m, those are comparable to the estimation by Asano and Iwata (2007). Those coefficients of variation are 9% and 11%, respectively. We will also investigate spatiotemporal characteristics of those statistical parameters in detail. From above analyses, we can conclude that we could obtain the reliable stable solution if we used efficient number of data and appropriate velocity structure model.

Acknowledgments: Strong motion data of K-NET and KiK-net of NIED and the daily coordinate data of GEONET of GSI are used in this study.

Keywords: kinematic source inversion, uncertainty, strong motion data, GPS data, the 2007 Noto Hanto earthquake