Source Process of the 2007 Noto Hanto Earthquake Estimated from Strong Motion Inversion: Validation of the northeast shallow slip

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The 2007 Noto Hanto earthquake occurred at 9:42 a.m. on March 25, 2007 (JST), and caused severe damage around Wajima and Anamizu. The purpose of this study is to understand the source process of the earthquake. We constructed a kinematic source model by the multi-time window linear waveform inversion of Yoshida et al. (1996) using strong motion data.

We selected 7 stations of K-NET and KiK-net strong motion networks. For the waveform inversion, velocity waveforms filtered with a passband of 0.05 to 1 Hz are used. We inverted the time histories from 1 s before the P-wave arrival to 13 s after the S-wave arrival. Based on the velocity structure models of J-SHIS/NIED and Ito and Wada (2002), we performed a inversion to determine the 1D velocity structure (Hikima and Koketsu, 2005) for each station. We assumed our rupture starting point at the hypocenter by JMA, and the fault plane model of 30 km in length by 18 km in width based on aftershock distribution, with strike and dip angles of N58E and 66 degrees based on the F-net CMT solution. We divided this fault plane into subfaults of 2km by 2 km for the analyses. Each subfault can slip 10 times every 0.5 s after triggering.

In the result, we recovered a large slip region near the rupture starting point and in the northeast shallow part of the fault. The northeast patch did not generate a independent wavetrain, but compensate for deficiencies of waveform amplitude. In order to confirm the source model including the northeast patch, we compared the static displacement computed for our source model with observed GPS data, and we could see that the northeast patch would not be necessary. Accordingly, we would have some problems in the Green functions. Our estimation of the total seismic moment was $1.86*10^{19}$ Nm (Mw 6.8), the maximum slip was 4.0 m, and the triggering velocity of the first time window was 2.8 km/s.