Source Model of the 2008 Northern Iwate Intraslab Earthquake by the Empirical Green's Function Method

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At 00:26 on July 24, 2008 (JST = UT + 9), a large intraslab earthquake (M_J 6.8, M_W 6.8) occurred within the Pacific slab subducting beneath northeast Japan at a depth of 108 km. This earthquake is a normal fault event in the lower seismic plane of the double deep seismic zone in the Pacific slab. Suzuki *et al.* (2008) estimated the kinematic source rupture process of this earthquake by the linear waveform inversion method using strong motion data in the frequency range 0.1 - 1 Hz. Their source model has two asperities located in the northern and southern segment of the source fault. The larger one is located in the northern segment. It is quite important for reliable strong motion prediction of intraslab earthquakes to investigate the difference and similarity of source characteristics between events in the upper deep seismic plane and the lower deep seismic plane.

In this study, the source model composed of strong motion generation areas (SMGA) is estimated by the broadband strong ground motion simulation using the empirical Green's function method (Irikura, 1986). The SMGA is a characterized rectangular area in the source fault, which has large slip and large slip-velocity (Miyake *et al.*, 2003). The observed ground motion records of an aftershock of M_W 5.1 occurring at 11:27 on July 24, 2008 are used as the empirical Green's functions. It occurred near the southern edge of the mainshock fault, and its focal mechanism was similar to that of the mainshock. The KiK-net downhole records in 0.2 - 10 Hz are the target in the strong motion simulation.

Firstly, the corner frequencies of the mainshock and the aftershock are objectively determined by the Source Spectral Ratio Fitting Method (Miyake *et al.*, 1999). The obtained corner frequency is 0.65 Hz for the mainshock and 2.68 Hz for the aftershock, respectively. From the obtained corner frequencies, two parameters for the empirical Green's function method, N and C, are determined. Then, the size, rise-time, rupture starting point, and rupture velocity of each SMGA, and the relative location and the rupture time of the second SMGA are estimated by the grid search. We follow the fault geometry proposed by Suzuki *et al.* (2008). The best model is estimated to minimize the residual function proposed by Miyake *et al.* (1999), which evaluates the residuals of displacement waveforms and acceleration envelopes.

The obtained source model consists of the first SMGA of 6.8 km^2 and the second SMGA of 27.0 km^2. The estimated stress drop on SMGA is 262 MPa. This result shows the similar tendency with the study by Asano *et al.* (2003) which concluded that the size of SMGA for intraslab earthquakes are smaller than that for inland crustal earthquake. Asano *et al.* (2004) have estimated the source model of the 2003 Off Miyagi intraslab earthquake using the empirical Green's function method. That earthquake occurred in the upper seismic plane of the Pacific slab. In their source model, the strong motion generation areas of the 2003 Off Miyagi earthquake have a stress drop of 105 MPa. From the result of this study, the intraslab event in the lower plane seems to have larger stress drop than one in the upper seismic plane.

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