S145-012 Room: IC Time: May 21 12:00-12:15

Broadband Source Process and Strong Ground Motions of the 2003 Off Miyagi Intraslab Earthquake (Mw7.0)

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A large intraslab earthquake (M_W 7.0), which occurred at a depth of 72 km within the Pacific slab off Miyagi prefecture, northeast Japan, on 26 May 2003, brought large ground motions to the area above the source region. The observed ground motions were rich in high-frequency components. In order to investigate strong motion generation process including high-frequency components from the source, it is quite important to estimate quantitatively slip velocity during the faulting. We have been developing a new kinematic source inversion method to obtain slip, peak slip velocity, and rupture time distributions in the broadband frequency range, and applied it to the 2003 off Miyagi intraslab earthquake (e.g., Asano and Iwata, 2006).

In this study, the empirical Green's function method, which utilizes the observed waveform data of a small event as the Green's function, is employed. The observed waveform data of M_W 4.7 aftershock on 27 May 2003 is used as the empirical Green's function. The source model is estimated by jointly inverting the velocity waveform data in the low-frequency range (0.2-1 Hz) and acceleration envelope data in the high-frequency range (1-10 Hz). The forward formulation of the waveform inversion is based on the empirical Green's function method by Irikura (1986) and Irikura *et al.* (1997). The empirical Green's function method is extended to introduce spatial heterogeneities of slip velocity intensity, duration of the filtering function, and rupture time. The unknown parameters for the inversion is slip velocity intensity, duration of the filtering function, and rupture time at each subfault. As source parameters of the small event can be estimated by approximating with a circular crack source model, the absolute values of final slip and peak slip velocity could be obtained.

A fault plane model is assumed following Asano *et al.* (2004). The spatial smoothing of each unknown parameter is included, and the strength of the smoothing is determined by ABIC approach. The data set composes of three components waveform data at 16 KiK-net borehole stations within 100 km from the epicenter. The 14 s of time history beginning from 1 s before the direct S wave arrival is used.

The obtained slip distribution showed two asperities or large slip areas. One was found in the vicinity of the hypocenter, and the other was found in north and deep portion of the fault plane. The broadband strong motion of this earthquake is thought to be mainly radiated from these two asperities. The overall feature of the source model is similar to the previous studies for kinematic waveform inversions (e.g., Aoi *et al.*, 2005; Wu and Takeo, 2004) and high-frequency envelope inversion (Nakahara, 2005). However, there are some differences remained. The asperity including the hypocenter has large peak slip velocity near the hypocenter. On the other hand, the deep asperity shows relatively large peak slip velocity close to the north edge of the asperity. These differences might reflect the difference in the rupture characteristics between them. The maximum value of the peak slip velocity is 9.8 m/s, which is somewhat large compared to that of inland crustal earthquakes. It could be cause of the strong high-frequency seismic wave radiation of this earthquake.

The source model obtained in this study could explain the observed acceleration time histories and their spectra in the broadband frequency range (0.2-10 Hz). However, some stations show discrepancy in the low-frequency acceleration spectra. It might be necessary to check the effect of the difference in the radiation pattern between small and target events.

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