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Source model of the 2000 Tottori-ken Seibu earthquake for the intermediate period range

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1. Introduction

To estimate appropriate source model for the prediction of strong ground motion for the intermediate period range around 1 s, we should use more sophisticated, modified structure model for calculation of the Green's functions. Here, waveform inversion is performed for the slip model of the 2000 Tottori-ken Seibu earthquake for the intermediate period range using modified structure model based on aftershock data.

2. Modification of structure model

We applied the R/V receiver function and estimated velocity structure models for each station. For shallowest part of about 0.1km, we used the well-logging data for each satiation by K-NET or KiK-net, while for deeper part more than 2.0km, we assumed 1D-velocity velocity model for all stations. We modified velocity model for depth part of about 0.1km to 2.0km with the R/V receiver function. The modified velocity model shows that the depth of the basement with an S-wave velocity of 3.5 km/s is about 0.65km at the sediment site station TTRH04 (KiK-net). Comparing the theoretical velocity waveforms and observed ones of aftershocks, modified velocity structure model gave better fitting for the waveforms of the direct S-wave part (Miyakoshi et al., 2002).

3. Waveform inversion

Strong ground motion records at 10 stations (KiK-net and K-NET) within a 50km epicentral distance were used. Using the modified structure model, we inverted the velocity waveform in the period range 0.5 s - 10.0 s to obtain a source model using the multi-time linear waveform inversion (Hartzell and Heaton, 1983). Rupture area (28km x 17.6km) is subdivided into 2.0km x 2.2km. The source time function in each subfault is represented by a series of six-smoothed ramp function with a 1.0s rise time with 0.5s apart. We constrained the variation of the rake angle to 0+-45 degree and set the first time window propagation velocity at 1.8 km/s. The final slip distribution is obtained by waveform inversion. Base on inverted slip model, we estimated seismic moment Mo = 1.8e+19 N*m. We extracted asperity area following the criterion by Somerville et al. (1999). The size of combined asperity area is about 75km^2. The size of asperity area are corresponded with those extracted from slip model with waveform inversion for the periods range over 1 s (Sekiguchi and Iwata, 2001). The size of combined asperity area correlate well with the empirical scaling relation between the asperity parameters and the magnitude obtained by Somerville et al. (1999).

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