# Effects of dynamic rupture parameters on theoretical seismic waveforms for a strike-slip fault

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We constructed a dynamic fault rupture model using an elliptical patch, and investigated the effects of dynamic rupture parameters on theoretical seismic waveforms for a strike-slip fault. We assumed a vertical rectangular fault plane whose depth of the upper edge is 0.5 km, and the length and width of the fault is 19.5 km ×18 km based on the case of the Tottori ken-chubu earthquake that occurred on 21 October 2016. For simplicity, we assumed pure left-lateral strike slip faulting. We also set the hypocenter as the location of the Hi-net automatic processing seismic source, and assumed the rupture spread from the hypocenter. Referring to slip distribution obtained by kinematic inversion of nearby seismic waveforms by Kobayashi et al. (2016), in which a large slipped area exists in the central part of the fault plane near the hypocenter, we set the center of elliptical patch at a center of the fault plane. We assumed that the long axis is parallel to the vertical direction, the length of the long semi axis is 7.0 km, and the length of the short semi axis is 4.0 km. A large slipped area exists in the central part of the fault plane just above the hypocenter. We employed the boundary integral equation method (Aochi et al., 2000) for dynamic fault rupture simulation and slip weakening law as a friction law. We used the finite difference method (Aochi and Madariaga, 2003) for simulation of seismic wave field. We assumed a semi-infinite homogeneous medium, and the calculation area was set to 100 km ×100 km ×20 km, including the fault. In this study, changing the values of initial stress, peak stress, and critical slip weakening distance in the elliptical patch, we aimed to evaluate the effects of the values on simulated seismic waveforms. For simplicity, the residual stress was set to 0 MPa both inside and outside of the patch. In addition, in order to prevent rupture propagation outside of the patch, we set the value of peak stress as 200 MPa outside of the patch. The value of peak stress in the initial crack with a radius of 1.0 km was set to 0 MPa. The values of the other dynamic rupture parameters in the initial crack were the same as those in the elliptical patch. In order to reduce the number of the parameter to be changed, we assumed the value of peak stress in the patch was twice the initial stress. Changing the value of peak stress between 20 and 80 MPa, and the value of the critical slip weakening distance between 0.10 and 0.30 m, we investigated how the simulated seismic waveforms change. The larger the value of peak stress (initial stress) was, the larger the amount of slip on the fault plane and the amplitude of the seismic waveforms were. The larger the value of the critical slip weakening distance was, the slower the rupture velocity on the fault plane and the arrival time of seismic waves were. The maximum value of moment magnitude became 6.1 when the values of peak stress and the critical slip weakening distance were 64 MPa and 0.30 m, respectively. Although the values of the dynamic rupture parameters were constant in the elliptical patch, we will compare the simulated seismic waveforms with those when Gaussian distributions are given (e.g. Di Carli et al., 2010).

 