Dynamic source parameters of the 2008 Iwate-Miyagi inland earthquake inferred from kinematic source model

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The spatial and temporal distributions of the stress on the fault planes of the 2008 Iwate-Miyagi Inland earthquake (M_0=2.4×10^{19} Nm, M_w6.9) is calculated from kinematic inversion result using a three-dimensional finite difference method for solving the elastodynamic equations. This event is dip-slip with surface rupture. We analyze the relations between stress and slip for all grid positions on the fault, and use these relations to infer the friction law for the rupture dynamics. Then, the dynamic source parameters were also determined. The distributions of the dynamic parameters on the fault are very heterogeneous. Average of dynamic stress drop on the asperity is ~13 MPa. Average fracture energy over the entire fault is estimated ~6 MJ/m^2, which coincides with the seismic moment relationship by Tinti et al. (2005). The fracture energy is proportional to the final slip. In general, the stress drop and fracture energy are correlated with the slip distribution. Rupture time on each subfault is determined based on peak stress time. The rupture propagation was gradually accelerated in the asperity, and was delayed along the surface. For the surface rupture earthquake, we estimate small or negative stress drop and small fracture energy, where large slip is estimated along the surface.

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