

Design of Earthquake Dynamic Rupture Model based on Kinematic Slip Distribution

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It is well known that a complete slip history in space and time can be converted to the complete stress change history in space and time. However, it is not always possible to obtain a complete slip history from waveform inversion analysis as was done by Ide and Takeo (1997). Miyatake (1991) proposed a practical method using only slip and rupture time distributions, but he did not take into account the constitutive relation on the fault. In this presentation, we propose a procedure to reconstruct a dynamic rupture model when only slip distribution and rupture times are available that has been estimated from kinematic waveform inversion analysis. We use the boundary integral equation method (BIEM) for static and dynamic propagation (Fukuyama and Madariaga, 1995, 1998). From the static BIEM, I estimated the stress drop distribution from slip distribution. Then, several trials of spontaneous dynamic rupture computation are conducted using dynamic BIEM with pre-defined slip-weakening frictions to fit the rupture time distribution. The free parameter is the S value, which is defined as the ratio of strength excess and stress drop (Das and Aki, 1977). In this ad-hoc procedure, several dynamic rupture models can be created whose rupture time distributions are quite similar. Through this modeling we can obtain the fracture energy distributions in addition to the extrapolated slip history with finer grids. This methodology will be useful when analyzing the high-frequency seismic radiation source on the fault based on kinematic models.