Dynamic Rupture Simulation of Reverse Fault Using BIEM with Free Surface: From Rupture Dynamics to Near-Fault Ground Motions

オック セバスチャン [1]; 福山 英一 [1]
Sebastien Hok[1]; Eiichi Fukuyama[1]

[1] 防災科研
[1] NIED

We developed a dynamic rupture computation code based with the Boundary Integral Element Method (BIEM) that includes both fault surfaces and the free surface, which is an extension of the BIEM with triangular elements by Fukuyama et al. (2002, AGU). A slip-weakening friction law is applied on the fault surface that governs the evolution of traction. For the Green's functions, we use the full 3D kernels developed by Tada (2006, GJI). By introducing the free surface condition in the BIEM code, we are now able to compute any kinds of fault geometry (kink, jog, curve, step, branch and so on) into a homogeneous elastic halfspace. We can now compute the interaction of the free surface with the propagation of dynamic rupture. This interaction is particularly important to study and model accurately the reverse faulting that is found in subduction zone, or intraplate thrusts. We present the validation tests of the code; we compared our code with other numerical schemes including static analytical solution (Okada, 1992, BSSA), discrete wavenumber code (AXITRA, Coutant, 1989) and finite difference code (Favreau and Archuleta, 2003, GRL). Finally we apply this code to the 2008 Iwate-Miyagi earthquake, a dipping thrust fault earthquake, to study the effect of dynamic rupturing. We also try to model the near-fault ground motions based on the slip distribution by kinematic waveform inversion (Suzuki et al., 2008, ASC).