AOGS 2005

Fault Geometry, Stress Field and Constitutive Law for Dynamic Rupture Simulation of the 2000 Western Tottori Earthquake

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In order to simulate dynamic rupture process of real earthquakes, we need realistic initial (total stress field) and boundary (fault geometry and constitutive relation) conditions1. Due to recent remarkable progress of seismic observation, laboratory experiment, and numerical simulation studies, we are now almost ready to simulate a realistic earthquake rupture based on the information on initial and boundary conditions observed in the field or measured in the laboratory. In this paper, I will demonstrate using the 2000 western Tottori earthquake what kind of information becomes available and what information is still required in order to make a realistic simulation of earthquake rupture. The 2000 western Tottori earthquake (*Mw* 6.6) occurred on October 6 in the southwestern part of Japan. Unfortunately, no surface fault trace appeared due to this earthquake. But, since there are plenty of seismic stations around the source area, very precise fault geometry was obtained based on the relocated aftershocks[2]. Stress field was estimated by stress tensor inversion technique[2].

The fault strength was estimated by the obtained stress field and each fault plane direction in a forward way[3]. Slip-weak distance was estimated using nearfault seismograms as well as the slip time function estimated by the waveform inversion[4]. By compiling these information, I could simulate the rupture propagation along the fault, which can quantitatively explain the slip distribution obtained by the waveform inversion[4].

Keywords: Earthquake dynamic rupture; Fault structure; Stress field; Fault constitutive law; Numerical simulation

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