SSA Abstracts Online

Finite-fault Model of the 2004 Mw 6.0 Parkfield Earthquake from Inversion of Strong-motion Data

LIU, P., CUSTODIO, S., and ARCHULETA, R., Institute for Crustal Studies, University of California, Santa Barbara, CA 93106-1100, pcliu@crustal.ucsb.edu, susana@crustal.ucsb.edu, ralph@crustal.ucsb.edu

The Mw 6.0 Parkfield earthquake of 28 September 2004 is the most well recorded event ever near the source, thus offering a unique opportunity to study earthquake physics. A starting point for a seismic investigation of the Parkfield earthquake is necessarily a kinematic inversion. We construct a finite-fault model, using the global inversion method of Liu and Archuleta (2004) to solve for spatial variation of source parameters: slip amplitude, rake, rupture time, and rise time. Three-component velocity ground motion from 19 stations (about 1/3 of the available data) is inverted to obtain slip amplitude, rake angle, rise time, and rupture velocity at the nodes (corners) of each subfault. Inside each subfault the source parameters are allowed to vary through bilinear interpolation. Green's functions are calculated with the Zhu and Rivera (2001) FK method. We use two different 1D velocity profiles in the inversion, one describing the local structure NE of the San Andreas Fault and a second corresponding to the SW side of the fault. The inversion yields a total seismic moment for the Parkfield earthquake of 1.35x1018 Nm. The largest amount of slip is observed around the hypocenter, and a second zone of significant slip is located NE of the hypocenter. Slip distribution indicates a bilateral rupture, although rupture to the northwest is much longer. The average rupture velocity is ~2.8 km/s, about 80 percent of the local S wave. Rise time, which averages ~0.8 seconds, is not well resolved. Agreement between data and synthetics in the band 0.16 Hz-1.0 Hz is good but can be further improved. Future work involves including a 3D velocity structure, attenuation, local and path effects (through empirical Green's functions), and fault geometry.

[Back]

Last Update: *2005-01-27*