

LOCAL AND REGIONAL MOMENT TENSOR INVERSION PROCEDURES FOR RAPID MONITORING OF SHALLOW EARTHQUAKE SOURCES IN THE CARIBBEAN

Mendoza, C., P.O. Box 693, Golden, CO 80402 USA, cmendoza33@msn.com
Huérfano, V., P.O. Box 5210, Mayagüez, PR 00681, victor@rmsismo.uprm.edu

Task 3 of the FEMA-sponsored Puerto Rico Tsunami Warning and Mitigation Program involved an evaluation of the use of waveform inversion schemes in the rapid identification of earthquake source parameters in the Caribbean. As a result of that work, local moment-tensor (LMT) and regional moment-tensor (RMT) inversion procedures were identified that derive earthquake source mechanisms and seismic moments of shallow earthquakes using three-component digital broadband waveforms. The procedures use moment-tensor inversion algorithms to identify the source parameters that best reproduce the local or regional waveforms recorded at one or more stations as represented by a point source. For locally-recorded signals, the moment-tensor inversion method of Zahradnik (2001) is used to derive earthquake source parameters using the entire recorded wave train at frequencies up to the corner frequency of the recording instrument. Theoretical ground motions are generated using the discrete wave-number method of Bouchon (1981) and the inversion is carried out in the frequency domain. In the regional procedure, the method of Randall et al. (1995) is used with source depth fixed at 10 km. A general 15-km-thick Caribbean velocity model is used to generate the synthetic Green's functions. A Butterworth passband filter with corners at 20 sec and 50 sec is applied to both synthetic and observed records to minimize errors resulting from unmodeled features in the crustal structure. The inversion schemes provide a timely derivation of source size and fault type that would be useful in the identification of potential tsunamigenic sources in the circum-Caribbean region. Funding has been obtained for 2004-2005 from the Puerto Rico Sea Grant Program and the University of Puerto Rico at Mayagüez to apply the methods to broadband waveforms recorded in real time by the Puerto Rico Seismic Network and to incorporate the procedures into the emergent Puerto Rico-Virgin Islands Tsunami Warning System (PRVITWS).