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Determination of Earthquake Source Parameters for the Elazig Earthquake on March 8th, 2010 and its Aftershocks

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An earthquake with a Moment magnitude of 6.0 (Mw=6.0) occurred in Basyurt-Karakoçan site in Elazığ Province on March 8th, 2010 which was followed by a sequence of earthquakes that are ranging from moderate to large scale. Seismic source parameters and scaling relations were determined by using a data set of 33 earthquakes which are records from the broad band network whose epicentral distances from the sensors vary in range of 10 - 600 km and whose earthquakes magnitudes are ranging from 3.3 M to 6.0 M between March 8th and August 30th. In this paper, the source processes of these earthquakes were analyzed in terms of the focal mechanism solutions, moment magnitude, seismic moment, spectral level of corner frequency, stress drop and fault dimension calculations. For the inversion, two different source models were used to determine the respective fault radii and displacements in the purpose of comparison and evaluation.
Source parameters determination for earthquakes in Elazig considering source time function were computed by Moment Tensor Inversion MTI represented by a point source model. Focal mechanism solutions were computed by using ZSACWIN software package. Obtained fault parameters from the inversion, fault geometry (strike, dip, and rake angles), and seismic moment were calculated according to the technique introduced by Dreger and Helmberger (1993), Dreger (2002). The focal mechanisms of 33 earthquakes are of mostly strike-slip fault type, and the seismic moment of main shock determined as Mo = 1.30e25 dyn-cm in general agreement with that reported by other agencies.
The displacement source spectra were determined by applying ω^{-2} spectral fitting procedure to classical Brune's (1970) model using SEISAN software package. The corrected spectra for S-waves within 10 sec were scaled to compute moment at the long period asymptote corresponding to the spectral plateau. Using the spectral amplitude for 0 Hz ($\Omega 0$), Mo and fc which controls the shape of the spectra were derived from the projection of the fit to the Brune's model by following Converging Grid Search (CGS) technique. The source dimension over a circular fault area, the average stress drop, and the Mw was calculated by empirical relations proposed by Hanks and Kanamori (1979). The Elazig earthquake is characterized by a main shock seismic moment Mo = 1.0e25 dyn-cm in general agreement with that reported by other agencies and Mo from MTI method's results.