Rapid magnitude estimation for moderate to large earthquakes using strong motion records in the Iranian plateau

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Abstract

Rapid estimation of earthquake magnitude has an effective role in emergency response operation. A fast determination of the earthquake magnitude is important to produce ground shaking and damage distribution maps in a short time after an event occurring. Iran Strong Motion Network (ISMN) has more than 1100 stations distributed in the Iranian plateau. The availability of a relatively large number of strong-motion records motivated us to do a study on rapid magnitude estimation. Three-component accelerograms of earthquakes with moment magnitude of 5 and greater are used. We calculated the parameter of total effective shaking by time integration of the absolute amplitude values of the three components over the strong shaking duration. There is an attenuation relation of total effective shaking with magnitude and hypocentral distance. We estimated coefficients of this attenuation relation through a least square regression analysis, and obtained a series of attenuation curves of total effective shaking in the moment magnitude range of 5 to 7. The estimated moment magnitudes match closely with reported values. This magnitude determination could be done, just after the waveforms have completed.