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Optimized automatic procedure for Mw estimation of regional seismic events

A. Gallo, G. Costa, P. Suhadolc, A. Valori, and L. Moratto
Department of the Earth Sciences, University of Trieste, Italy (costa@units.it)

A stable and automatic method, based on Andrews (1986) approach, is implemented and optimized to estimate in real time the seismic moment (and Mw magnitude) from broad-band velocimetric and accelerometric data.

The S phase is extracted applying both a manual picking procedure and an automatic method with travel times estimated from the knowledge of the hypocenter, recording site and structural model. The transversal component of motion is used to minimize conversion effects. The analyzed frequency window is chosen on the basis of comparison between signal and noise spectra (S/R ratio). The source spectrum is obtained by correcting the signals for geometrical spreading and intrinsic attenuation. We compute source spectra for both velocity and displacement, and following Andrews (1986), the seismic moment and the corner frequency, f0. In order to obtain more stable f0 values an optimized procedure is proposed by fitting with an ω^{-2} line the high-frequency decay.

The real-time procedure is tested off-line with recordings of significant earthquakes in the area (Bovec 1998; Bovec 2004; Carnia 2002) for which the seismic moment and Mw values, obtained by waveform inversion, are available. The results are in very good agreement. The procedure is also tested for the 2006-2007 events with Ml$>$2.0 occurred in the Southeastern Alps area. The obtained Mw values agree with the Mw coda estimates (Mayeda et al., 2003).