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# Seismic moment estimated from the response spectra for small seismic events occurred in North-Eastern Italy

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A stable and reliable estimation of the energy released by the seismic events is a fundamental step to understand the dynamic of the source processes even for earthquakes of small sizes recorded by local networks. In the case of seismic networks devoted to monitoring human activities carried out underground, such as oil/gas production, gas storage or geothermal exploitation, the ability of estimating Mw values in quasi-real-time allows for compiling microseismicity catalogues, which are an essential information for the running of traffic lights protocols.
Atkinson et al. (2014) noticed that the Mw values have a good correlation with the acceleration response spectra computed at specific periods; they developed a procedure utilizing simple attenuation relations that may be previously built on synthetics computed with a point-source model and then calibrated on the available recorded data. In that method, the lower magnitude bound is limited by the quality of the signals at recording stations (i.e. the signal-to-noise ratio), while the upper bound is defined by both the point-source approximation validity and the stress drop, which constrains the corner frequency of the source spectrum. Atkinson et al (2014) found it convenient computing the moment magnitude from the response spectra of the vertical motion (so to limit possible local site effect) at periods of 0.3 s and 1.0 s.
In this study, we apply that methodology to valuate the seismic moment of the small earthquakes occurred in the North-Eastern Italy in the last year. Synthetic seismograms are calculated by a stochastic approach with a point-source model and parameters representing the propagation characteristics of the studied area. By those simulations we build up specific relationships that are calibrated on the signals recorded by the local network. We are successful in estimating the moment magnitude for events in the range $1.5 \leq Mw \leq 4.0$. By comparing our results with values estimated by different methods in the same area, we obtain a good fit and low residuals. This procedure can easily be introduced in a real-time system to obtain fast and robust estimations of Mw.