Revisiting the Accelerating Moment Release method: examples of application to Italian seismic sequences

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From simple considerations we propose a revision of the Accelerating Moment Release (AMR) methodology for improving our knowledge of seismic sequences and then, hopefully in a close future, to reach the capability of predicting the main-shock location and occurrence with sufficient accuracy. The proposed revision is based on the introduction of a "reduced" Benioff strain for the earthquakes of the seismic sequence where, for the same magnitude and after a certain distance from the main-shock epicentre, the closer the events the more they are weighted. In addition, we retain the usual expressions proposed by the ordinary AMR method for the estimation of the corresponding main-shock magnitude, although this parameter is the weakest of the analysis. Then, we apply the revised method (that we call Revised AMR, or shortly R-AMR) to four case studies in Italy, three of which are the most recent seismic sequences of the last 9 years culminating with a shallow main-shock, and one is instead a 1995–1996 swarm with no significant main-shock. The application of the R-AMR methodology provides the best results in detecting the precursory seismic acceleration, when compared with those found by ordinary AMR technique. We verify also the stability of the results in space, applying the analysis to real data with moving circles in a large area around each mainshock epicentre, and the efficiency of the revised technique in time, comparing the results with those obtained when applying the same analysis to simulated seismic sequences.