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Evaluation of Earthquake Stress Parameters and its Scaling During the Recent Central Italy Sequence

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The Amatrice-Norcia-Visso sequence is characterized by a complex behavior as it is not a typical mainshock-aftershock sequence (Marzocchi et al. 2017) but more than one major quakes triggered the aftershocks that occurred for months.
In this study we focus on the Amatrice mainshock (August 24, 2016 Mw=5.97, magnitude from R.B. Herrmann's web page, Data and Resources section) and its aftershocks to evaluate the stress scaling in order to improve our knowledge of processes that control small and large earthquakes within this active region of Italy. The stress parameters in fact, play an important role in hazard prediction as they have a strong effect on the observed and predicted ground shaking.
We analyzed 83 events of the sequence from August 24th to October 16th 2016, within a radius of 20 km from the mainshock and with a Mw ranging between 5.97 and 2.72. All the moment magnitudes of the events used in this study derive from moment tensor estimations by R.B. Herrmann's web page, Data and Resources section.
Taking advantage of the averaging nature of coda waves, we analyze coda-envelope-based spectral ratio (Mayeda et al. 2007) using equations proposed by Walter et al. 2017 which considers stable low-frequency and high frequency spectral ratio levels (LFL and HFL respectively), to evaluate corner frequencies and apparent stress of the events within the sequence.
Coda spectral ratios were computed for all pairs with three "target" events: the mainshock (Mw=5.97) and other two large events (Mw=5.29 and 4.46) of the first sequence. For these events we have independent seismic moments (from R.B. Herrmann's web page) that we used as constraint for the LFL evaluation, while the HFL is estimated through a best fit analysis on the observed data.
The stress drop and corner frequencies resulting from our analysis were compared to those obtained by Malagnini et al. 2018 that used hundreds earthquakes applying spectral ratios based on the analysis of direct S-waves. Although our analysis is based on 83 events, the results are in good agreement demonstrating once more that the use of coda waves is more stable than direct waves (Sato and Fehler, 1998; Mayeda et al. 2003, 2007) allowing to get the same quality also with a smaller number of events.
The results evidence the non-self-similar behavior of the earthquakes within the sequence suggesting a change in dynamics between the largest events and the smaller aftershocks. For the future we plan to analyze the whole sequence, including the other mainshocks and large events to better constraint the Mw at which we observe the break in self-similarity.