



Seismic sequences, swarms, and large earthquakes in Italy

Alessandro Amato (1), Nicola Piana Agostinetti (2), Giulio Selvaggi (1), and Franco Mele (1)

(1) Centro Nazionale Terremoti, Istituto Nazionale di Geofisica e Vulcanologia, Roma, Italy, (2) Geophysics Section, School of Cosmic Physics, Dublin Institute for Advanced Studies, Dublin, Ireland

In recent years, particularly after the L'Aquila 2009 earthquake and the 2012 Emilia sequence, the issue of earthquake predictability has been at the center of the discussion in Italy, not only within the scientific community but also in the courtrooms and in the media. Among the noxious effects of the L'Aquila trial there was an increase of scaremongering and false alerts during earthquake sequences and swarms, culminated in a groundless one-night evacuation in northern Tuscany in 2013.

We have analyzed the Italian seismicity of the last decades in order to determine the rate of seismic sequences and investigate some of their characters, including frequencies, min/max durations, maximum magnitudes, main shock timing, etc. Selecting only sequences with an equivalent magnitude of 3.5 or above, we find an average of 30 sequences/year. Although there is an extreme variability in the examined parameters, we could set some boundaries, useful to obtain some quantitative estimates of the ongoing activity. In addition, the historical catalogue is rich of complex sequences in which one main shock is followed, seconds, days or months later, by another event with similar or higher magnitude

We also analysed the Italian CPT11 catalogue (Rovida et al., 2011) between 1950 and 2006 to highlight the foreshock-mainshock event couples that were suggested in previous studies to exist (e.g. six couples, Marzocchi and Zhuang, 2011). Moreover, to investigate the probability of having random foreshock-mainshock couples over the investigated period, we produced 1000 synthetic catalogues, randomly distributing in time the events occurred in such period. Preliminary results indicate that: (1) all but one of the the so-called foreshock-mainshock pairs found in Marzocchi and Zhuang (2011) fall inside previously well-known and studied seismic sequences (Bellece, Friuli and Umbria-Marche), meaning that suggested foreshocks are also aftershocks; and (2) due to the high-rate of the Italian seismicity, there is often the possibility of having one foreshock-mainshock pair even in the case of randomly distributed events.