# Seismic quiescence precursors to the last two damaging sequences in Central Italy (2009 Mw = 6.3 L'Aquila and 2016 Mw 6.5 Amatrice-Norcia)

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The 2016 seismic sequence in central Italy fell in a seismic gap between northern and central Apennines, between the 1997-1998 Umbria-Marche and the 2009 L'Aquila earthquakes, which occurred around 50 km to the northwest and the southeast, respectively. We investigated seismicity patterns preceding the occurrence of the 2009 and 2016 earthquakes. We applied the Region Time Length (RTL) algorithm to study detailed property of the quiescence. The algorithm measures the level of seismic activity in moving time windows by counting the number of earthquakes, weighted by their size, and inversely weighted by their distance, in time and space from the point of observation. We used a declustered catalogue. Declustering is particularly difficult in the Apennines, due to the closeness in space and time of different clusters. For this reason, to detect earthquake clusters, we used a statistical method called "nearest-neighbours" based on nearest-neighbour distances of events in space-time-energy domain. The method allows decomposing the seismic catalogue into background seismicity and individual sequences of earthquake clusters. We found that both the L'Aquila and the Amatrice events were preceded by periods of seismic quiescence in the focal region. The analyzed cases are also compared to the results available in literature applying RTL and Z-mapping to previous Italian events, including the 1997-1998 Umbria-Marche earthquake.