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Spatial and temporal evolution of low-energy seismic sequences (1990, 1991-1992 and 1997) in the Sannio area (Southern Apennines, Italy) in relation to the existing structural discontinuities: implication for the seismogenic potential.

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The Southern Apennines orogen of Italy is currently experiencing extensional deformation nested in the topographic culmination of the chain. The seismogenic expression of extensional deformation is represented by high-magnitude (M$\sim$7) earthquakes on major fault segments, and, locally, by low-energy sequences following the major seismic events.

We analysed the spatio-temporal distribution of seismic events belonging to three recent low energy (*Mdmax*=4.1) seismic sequences (1990, 1991-92 and 1997) that affected the northern sector (Sannio-Benevento area) of the Southern Apennines chain, in order to find correlation between seismicity evolution and the structural geologic settings of the area.

We performed a detailed analysis of the spatio-temporal features of the whole seismicity affecting the area by sub-setting each different seismic sequence in a number of event groups on the basis of the event clustering.

This allowed us to reconstruct the evolution of seismicity both in time and space, and to define location and strikes of several fault segments activated in different times.

The geological and structural setting of the area has been characterized by collecting all the available information integrated, in GIS environment, by the results of a lineaments analysis performed by photo interpretation of both a digital terrain model (DTM 20x20 spatial resolution) and a high resolution digital color orthophoto (1m pixel). Particular attention has been devoted to the detection of recent displacement, which has also been checked in the field.

We found that the seismogenic surfaces progressively activated during the 1990, 1992 and 1997 seismic sequences do not follow the major structural lineament exposed at surface, but exploit deeper ($\sim$10-15 km) structural discontinuities in the crust. Notwithstanding, location of the seismogenic surfaces of the 1990-92 sequence well fit the 3-D location of the seismogenetic fault responsible for the larger historical earthquake in the area (*Io*max=XI *MCS*, 1688 earthquake).

The correlation between the spatial features exhibited by the hypocenter locations of recent low energy seismicity and the rock volumes involved in the 1688 earthquake suggest that: (a) the present-day seismic activity is related to the reactivation of the fracture field produced by the 1688 high energy seismic event; (b) at the present, the seismogenetic fault responsible for the larger earthquake that affected this area does not appear capable of accumulating large strain, and consequently seismic energy release occurs through low energy sequences.