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ABSTRACT BOOK

a cura della Società Geologica Italiana



The Geoscience paradigm:
resources, risks and future perspectives



The clustered microseismicity in Benevento high seismic risk area (Southern Apennines) - a template-matching approach

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Benevento province is a high seismic risk area struck in historical and early instrumental times by moderate-to-large earthquakes that caused severe damage (1456, 1688, 1694, 1702, 1732, 1805, 1930, Io up to X–XI MCS). The study area is located in the southern Apennines in a sector undergoing extension at a rate of a few mm/yr. The available focal mechanisms of the major earthquakes show an SW–NE trending nearly horizontal T-axes consistent with the regional stress field and the active normal fault pattern. In addition to the aforementioned major earthquakes, in the 60s, a moderate complex seismic sequence occurred northeast of Benevento town. It was characterized by two major normal fault seismic events 10 minutes apart (21 August 1962, M_L 5.7 at 18:09, a mainshock with M_L 6.1 at 18:19) that involved small foreshocks and aftershocks (Westaway, 1987).

Close to the 1962 earthquakes, on 27 September 2012, the Benevento area was hit by a seismic event with M_L 4.1 (Adinolfi et al., 2015). Unlike the previous upper crust earthquakes associated with the normal fault pattern, the seismic source of this event showed right-lateral strike-slip kinematics. It was located at depths between 16 and 20 km, highlighting seismotectonic complexities previously unknown.

The seismicity observed in the last 40 years is mainly characterized by low-energy sparse events or swarm activities. To gain insight into the seismotectonic framework of this area, we analyzed the seismic activity reported by the new release of the Italian seismic catalog (CLASS, Latorre et al., 2022) in the time interval spanning from 2012 to 2022, in which the seismic network configuration can be considered stable.

We enhanced the catalog by template matching technique using the open-source seismological package PyMPA (Vuan et al., 2018), obtaining a significant increment of the output catalog of ~ 6-8 times the Italian Seismic Bulletin and CLASS.

We detected 3 seismicity clusters close to the 2012 strike-slip seismic sequence and 2 others southwestern Morcone localities (north of Benevento) at depths greater than 12 km ($M_{L,max}$ 3.0).

We detected the foreshocks of the seismic sequences of 2012 and characterized the seismic activity in foreshock, mainshock and swarm-like seismic sequences.

The non-homogeneously distributed seismicity extends for about 40 km. It is mainly composed of spatially complementary seismic swarms highlighting a slow deformation sector below the base of the seismogenic layer of the southern Apennine extensional domain. A future study on earthquake kinematics may add some other critical seismotectonic constraints.

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