SEISMOLOGICAL INVESTIGATION OF THE 2016 LOW MAGNITUDE SEISMIC SEQUENCE NEAR BARANELLO (SANNIO-MATESE AREA, SOUTHERN APENNINES - ITALY): FIRST RESULTS

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On January 16, 2016 a low energy earthquake (M_L<4.0) occurred SW of Campobasso in the Sannio-Matese area, few kilometres away from Baranello and Busso villages. Intense swarm-type earthquake activity followed this event and lasted for about two weeks. This swarm, which was the most relevant in the Sannio-Matese area after the 2013-2014 sequence, has aroused a remarkable interest both into the scientific community and in the Italian Civil Protection because it is localized near to the seismogenic source of the 1805 earthquake reported in DISS Working Group (2015). The village of Baranello is one of the places where the damages of this earthquake have been estimated with I≥X MCS. As well know in the literature, the Sannio-Matese area is considered one of the most active seismic areas of the Italian peninsula. It is struck by large destructive (Io>X MCS) historical earthquakes (e.g. 1349, M_W =7.0; 1688, M_W = 6.6; 1805, M_W = 6.8; DISS Working Group, 2015; Fig. 1) and the instrumental seismicity of the last 20 years show both the occurrence of low magnitude single events (M_L<3.0) and low magnitude seismic sequences and swarms (e.g. Milano, 2014 and references therein). Among these low magnitude seismic sequences, one that has occurred in 1997-98 (M_{Lmax}=4.1) is located in the south-eastern edge of the Matese Massif, between the 1805 and 1688 seismogenic sources. The one that has occurred in 2001 (M_{Lmax}=3.6), instead, took place near the north-western edge of the Matese Massif, in proximity of the NW termination of the 1805 seismogenic source. The epicentres of these sequences are roughly aligned in NNE-SSW direction and the hypocenters are confined between 5 and 15 km in depth. The last relevant seismic sequence occurred between the late 2013-early 2014 following a M_L=4.9 earthquake. This sequence struck the internal part of the Matese Massif in an area where no evidence of active faulting has been recorded so far.

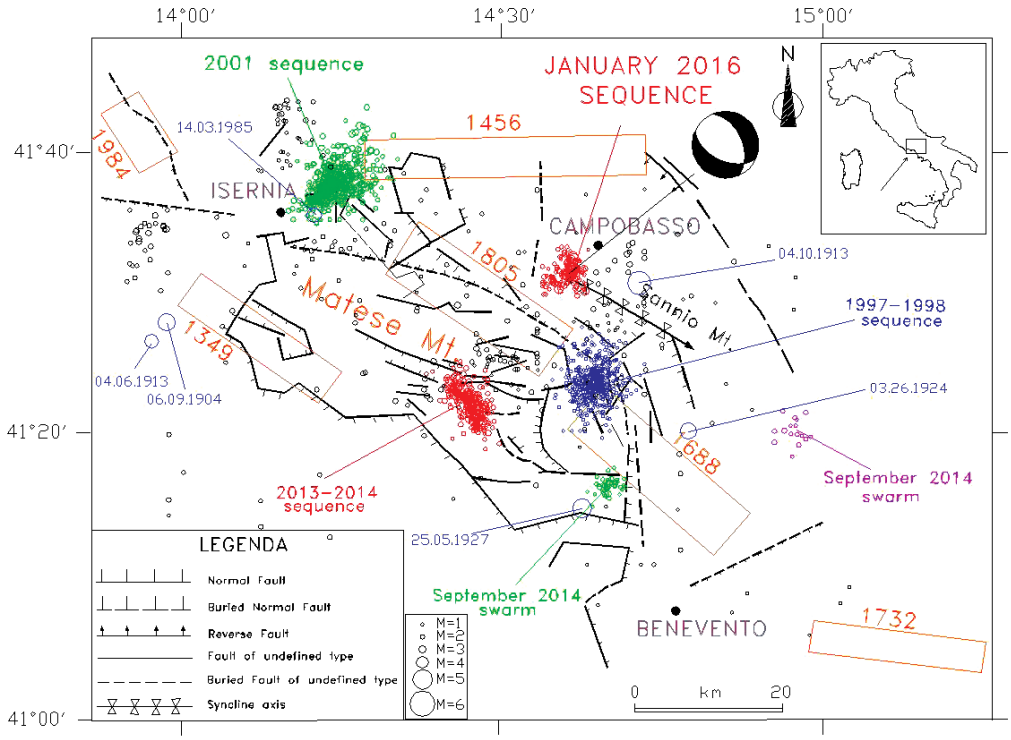

Fig. 1 – Map showing the main structural lineaments of the Sannio-Matese area (redraw after CNR-PFG, 1983) on which is reported the epicentral distribution of the seismicity that occurred in the last 20 years (data from Milano, 2014 and references therein) and that occurred to the January 2016. The rectangles with the years represent the main seismogenic sources of the strong earthquakes that struck the area (DISS Working Group, 2015). The epicenters of the earthquakes with 4<M<5 that occurred in the last century are also reported (blue circles with a date); the black circles represent single events. The focal mechanism is related to the January 16, 2016 event.

The epicenters of the sequence formed a ~10 km long NNW-SSE trending alignment and the hypocenters are confined in the 10-20 km depth range. In spite of this high seismicity, also testified by moderate energy events ($4<M_L<5$) occurred in the last century (Rovida *et al.*, 2016), the knowledge of the location, geometry and kinematics of the active fault segments in the Sannio-Matese area is scarce with respect to other seismogenic areas of Italy. The study of the 2016 low magnitude seismic activity may offers the opportunity to deepen the knowledge on the seismotectonic and to add new information to improve the valuation of the seismic hazard of the area.

Inspecting the seismic activity before the January 16, 2016 (18:55 UTC) event, we note that the sequence was not triggered by the mainshock, as this was preceded by an increment of the seismicity started about a week before. This increase in seismic activity was particularly significant in the 36 hours leading up to the main event. In the whole, about 40 events, with magnitude $1.5<M_L<2.8$, have occurred since 10 January, more than 60% of which in the 36 hours before the mainshock. After this and until the end of January, more than 150 events, with magnitude $1.2<M_L<2.8$, have been recorded. Relatively to this time-period, only 5 events, included the mainshock, have $M_L>3.0$. After the end of January, the seismic activity was characterized by few low magnitude single events. A new swarm-type earthquake activity, constituted by about 55 events with $M_L<2.1$, occurred in the time period 3-12 April.

In order to obtain reliable hypocenters location and fault plane solutions, the waveforms of the events belonging to this sequence have been collected to perform a re-picking of the P- and S- phases. The epicentral distribution of about 200 best located events occurred in January

2016 shows that seismicity is focused in a small area of about 7x7 km (Fig. 1). Epicenters do not show a clear alignment. However, a roughly NNW-SSE trend of the seismicity can be recognized. The hypocenters fall between 5 and 18 km in depth with a concentration of events between 8 and 13 km. The fault-plane solutions of some events with M_L>2.0 show normal dip-slip mechanisms with a prevalence of ~NW-SE striking planes. The fault plane solution of the mainshock, whose hypocenter depth is ~11 km, shows similar mechanism of the above. The spatial distribution of the T- and P-axes of almost all computed focal mechanisms is consistent with the large scale extensional regime that characterize the Apennine Chain.

The seismic sequences that occurred in the Sannio-Matese area in the last two decades are all located in the proximity of the NE dipping Isernia-Bojano-Guardiaregia normal fault system, that is considered the seismogenic source of the 1805 earthquake. The comparison among these sequences, however, evidences considerable differences among them although their epicentral areas are not far away.

References

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