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Comparison of two low magnitude seismic swarms in Calabria (Italy)

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We studied two seismic swarms occurred recently in Calabria, one in the Mesima-valley and one near Albi. Earthquakes were located by manually picking P and S waves. A search for clusters of events characterized by similar waveform was done, then the relative location was performed for any clusters. The focal mechanism was computed for as many events as possible, comparing the observed seismograms with synthetic signals for events of $M > 2.8$, and considering the polarity of P and S waves for smaller events. For very small earthquakes we tried an estimation of the focal mechanism by comparison of the few clear signals with the recordings of stronger events. This analysis is aimed at investigating whether the many earthquakes of a swarm are produced by the same fault or by faults characterized by different orientation.

The Mesima valley area was affected by a seismic swarm that begun with a M3.6 earthquake on May 26, 2019. More than 140 events of smaller magnitude occurred in the same area during the following month. The relative location shows a hypocenter distribution with depth between 16 and 19 km and elongated for about 2 km in the NE-SW direction. The seismogenetic volume estimated from the relative location is of about 12 km³. The focal mechanisms computed for the 9 strongest events of the swarm are very similar among them, indicating a dip-slip normal kinematics. The comparative observation of P-wave polarity suggests that the most events of this swarm were likely generated by the same fault. In fact, even very small earthquakes ($M < 1.5$) for which we can't give a reliable estimate of the focal mechanism, are characterized by P wave of the same polarity of stronger events at the stations around the epicenter.

Albi seismic swarm is one of the most interesting occurred in the central-eastern part of Calabria during the last 10 years. It begun on January 16, 2020, with a M3.8 earthquake, followed by more than 120 events in a month, and many others later. Detailed analyses were performed on as many earthquakes as possible, including absolute location, search for clusters of similar events and their relative location, and the estimation of focal mechanism. Results clearly indicate that this swarm was generated by a much greater seismogenetic volume if compared with the Mesima valley swarm. In fact hypocenters are much more spread, forming a cloud in the 6-12 km depth range, with a volume of at least 30-40 km³, and without any clear shape or direction. The search for clusters gave many families of similar events. Events of different clusters show waveforms quite different among them. Sometimes earthquakes located very near to each other have opposite P-

wave polarity at the same station. Focal mechanisms confirm the heterogeneity of this swarm. The only common feature is the normal kinematics, while strike and dip cover wide ranges of values. Therefore we conclude that this swarm was generated by many small faults with different directions, activated by an extensional stress field.