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Fault activation after vigorous eruption: the December 8, 2015 seismic swarm at Mt. Etna

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From December 2, 2015, volcanic activity suddenly occurred on Mt. Etna with very violent fire fountaining at central crater, known also as “Voragine”. This activity continued with other intense episodes at the same crater during the three following days and involving also, in turn, all the other three summit craters. This sudden eruption produced a rapid deflation of the volcano and was followed, from December 8, by a seismic swarm, with almost eighty earthquakes during this day, located on the uppermost segment of the Pernicana-Provenzana Fault System (PPFS). This seismicity was characterized by shallow foci (from few hundred meters until 1.5 km below the sea level) and main shock with 3.6 Magnitude. In order to investigate and measure the dynamics controlling and accompanying the PPFS activation, a dataset composed of C-Band Sentinel-1A data has been used for SAR Interferometry (InSAR) analysis. Some interferograms have been generated from ascending and descending orbits in order to analyze both short- and long-term deformation. The availability of GPS data allowed comparing and integrating them with InSAR for ground truth and modeling aims. The surface kinematics and modeling obtained by DInSAR and GPS data and integration have been compared to the distribution of the seismicity and related focal mechanisms in order to define the fault geometry and motion. The fault plane solutions obtained in the PPFS sector show kinematic already known from literature, in fact both left strike-slip and reverse movements are present. Moreover, essential constraints have been achieved about the PPFS dynamic and its relationship with the intense volcanic activity occurred. In particular, the observed compressive dynamic is consistent with a rapid deflation of the volcano.