Slipping on the faults of east flank of Mont Etna during December 2018 volcanic unrest. Results and numerical modelling of UNICT_NET GNSS Network monitoring and Sentinel-1 SAR interferometry

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The short but intense flank eruption developed from SE base crater of Mt. Etna, from 24th till 25th December 2018, was affected by a feeder-dyke which produced a radial deformation along both east and southwest slopes of Mt. Etna Volcano. The intrusion of the dyke has triggered a coseismic and aseismic deformation of Etna shear lineaments causing on 26th December 2018, MW 4.9 earthquake on the Fiandaca Fault, accompanied by the reactivation on 8th January 2019 (ML = 4.1) of the Pernicana Fault. The Geodynamics & GeoMatic Laboratory Working Group, since 2014 has designed and implemented the discrete geodetic network named UNICT-Net, monitoring the framework of shear lineaments affecting the eastern slope of the Etna volcano. The GNSS measurements, improved by literature data, have provided velocity field and displacement, quantifying the aseismic and coseismic deformation of all the main discontinuities of eastern flank of Etna during the 2018 December unrest period. The monitoring of the all lineaments allowed us to observe the deformation of the fault belts during the pre, sin and post- intrusion of the dyke. In particular, we observed that the most of the deformation was released during latter time phase. The strain field was also recorded by Interferometric data (Sentinel-1) with a time series of about one year.

We think that only a part of the stress was accommodated by creep deformation on incipient detachment in the clayey sedimentary substrate. Therefore, the deformation recorded on the surface across all fault segments could be still elastic. In order to improve the deformation monitoring, a permanent GNSS local network is ongoing to be installed between one critical fault segments.

The collected geodetic measurements allowed us to infer the deep geometry and kinematics of two main linked fault segments that we consider as sources of the 26th December 2018 earthquake. The retrieved information, together with analysed structural-geology, tectonic, and rock-physics data, have led to new insights into the volcano tectonics processes.