

The puzzle of Mt. Etna, the 2015 eruptive activity

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In 2015, Mt. Etna volcano supplied three sequences (Jan-Feb, May and Dec) of eruptive activity spanning from lava effusion to intense and impulsive explosive phases. Here, these sequences are investigated by exploiting an extensive and multi-parametric geophysics and gas geochemical dataset, such as to explore the likely and reliable mechanisms behind the observed phenomena. Overall, the integration of different parameters allowed us to discriminate a long-lasting inflation period abruptly interrupted by two vigorous short-term deflations accompanied by increase of the deformation and seismic activity of the north-eastern sector of the volcano after the first eruptive. The dynamics of this unstable flank of the volcano edifice was characterized by two seismic swarms ($M_{max} = 3.6$) occurring along the middle segment of the Pernicana Fault and aseismic slip with intense deformation affecting the north-eastern edge of the flank. Geochemical observations showed remarkable changes in plume SO₂ and HCl emissions consistent with ground deformation data and volcano seismic tremor behavior. This is not the first time in which the interaction between volcanism and tectonics has been observed at Mt. Etna and other basaltic volcanoes; although nowadays such interaction is still poorly constrained. In our study, the multidisciplinary approach suggested that, at least for the 2015, the eruptive activity was mainly triggered by the tectonic framework of the volcano and in particular by the instability of its north-eastern flank.