



Multiparametric investigation of Mt. Etna dynamics during 2013: evidences of variations of shallow plumbing system

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At Mt. Etna volcano, the period 2013 was characterised by intense eruptive activity at the summit craters (mainly Voragine, Bocca Nuova and New South East crater). The first two craters showed strombolian activity, while the third one intense lava fountaining, taking place in two cycles February-April and October-December. In this work, we mainly focused on the period in between these cycles, applying a multiparametric approach, based on seismic, infrasonic, geodetic and geochemical data, to reconstruct the volcano dynamics during the inter-eruptive interval. In particular, the period from the end of April to 5 September showed a gradual amplitude increase (more visible from June) of both LP events and volcanic tremor, a spectral features change of the LP events, a slight inflation testified by both clinometric and GPS data. On 5 September, at the same time as a strong explosion at Bocca Nuova crater, we observed an instantaneous variation of the afore mentioned signals (decrease of amplitude of both LP events and volcanic tremor, shift of the volcanic tremor centroid, LP event spectral change and slight deflation mainly highlighted by clinometric data), as well as the activation of a new infrasonic source (still active at the end of 2014) located in the Bocca Nuova crater, mainly related to degassing processes. The variations observed from the end of April to 5 September were interpreted as due to a gradual pressurization of the plumbing system, which did not involve only its shallowest part (where the LP sources were located) as testified by the geodetic data. Soil CO₂ flux measurements showed a similar trend, with a generally steady increase starting in March, hitting a peak on 3 September, and then falling dramatically until the end of November. This pressurization phenomenon ended instantaneously with the explosion of 5 September, and then with the opening of a new vent in the Bocca Nuova crater, still generating infrasonic events at the end of 2014. Such apparently slight change in the plumbing system also led to the gradual renewal of the New South East crater activity, culminating with the second lava fountain cycle. This work demonstrates the importance of the multiparametric approach to reconstruct the volcano dynamics.