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The Dec 24, 2018 eruptive intrusion at Etna volcano revealed and imaged by multi-disciplinary deformation networks (borehole tiltmeters, borehole strainmeters, continuous GPS, mobile GPS, InSAR)

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On 24 December 2018 morning a violent intrusion occurred on Mt. Etna volcano causing the opening of an eruptive fissure, which propagated downward from the summit crater area towards SSE. From the upper part of the fissure lava flows poured out for three days descending towards east into the Valle del Bove depression area. The eruptive fissure was accompanied by a seismic swarm during its propagation both and during the final stopping phase. The seismic swarm triggered by the intrusion continued for weeks after the end of the eruption. The seismicity involved some of the shallow volcano-tectonic structures located in the northeastern, eastern and southern flanks of the volcano, with the strongest event (Mw = 4.9) on the southeast flank, along the Fiandaca fault.

Besides the high seismic response in the south-eastern flank, a main concern was that the fissure would propagate farther downslope and discharge its magma in a more dangerous flank eruption. However, the propagation stopped. The deformation monitoring networks managed by the INGV-OE (borehole tiltmeters, borehole strainmeters, extensimeter, permanent continuous GPS, mobile GPS arrays and satellite DInSAR) recorded a clear and complete deformation pattern during the ongoing eruptive process. The different monitoring systems recorded real-time and near real-time data that were extremely useful during the first phase to reveal the eruption onset and to understand the intrusion mechanisms and position, as well as the dynamics of the volcano induced by the intrusion. They were also helpful during the following hours to infer its propagation, and, during the next days, to confirm its stopping.

We present the different data acquired, the precious information and constraints they provided during the eruption course. We also propose the first modeling attempts to interpret all the different kind of deformation data.

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