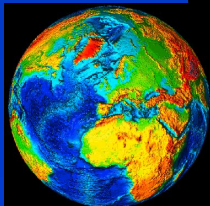


The VEI 2 Christmas 2018 Etna Eruption: A small but intense eruptive event or the starting phase of a larger one?

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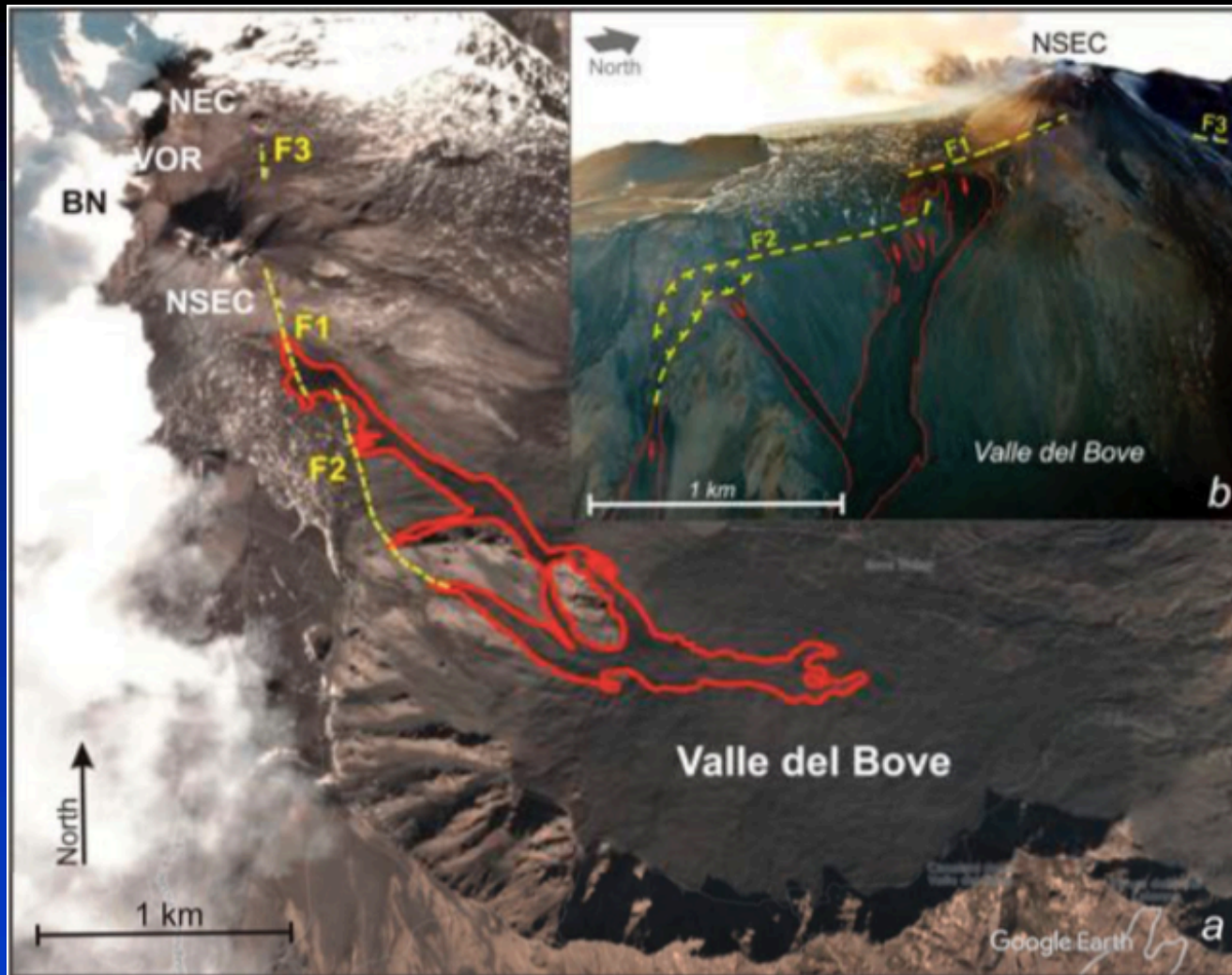
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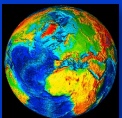
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The Etna flank eruption that started on 24 December 2018 lasted a few days and involved the opening of an eruptive fissure, accompanied by a seismic swarm and shallow earthquakes, significant SO₂ flux release, and by large and widespread ground deformation, especially on the eastern flank of the volcano. Lava fountains and ash plumes from the uppermost eruptive fissure accompanied the opening stage, causing disruption to Catania International Airport, and were followed by a quiet lava effusion within the barren Valle del Bove depression until 27 December. This was the first flank eruption to occur at Etna in the last decade, during which eruptive activity was confined to the summit craters and resulted in lava fountains and lava flow output from the crater rims. We used ground and satellite remote sensing data to describe the sequence of events, quantify the erupted volumes of lava, gas, and tephra, and assess volcanic hazards.

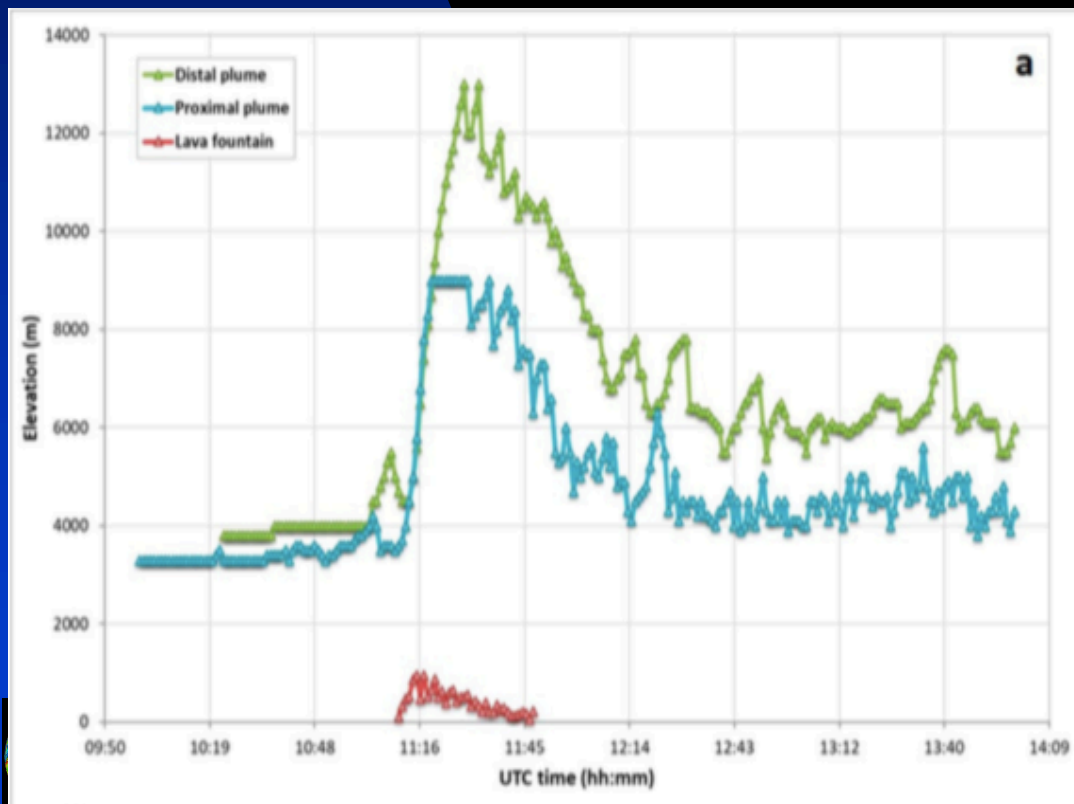
The lava flow and fracture field



Map of the 24-27 Dec 2018 lava flow field (red outline) and of the fissure field (F1, F2 and F3, yellow dotted lines). (a) Plan view from Google Earth. (b) Helicopter photo, view from East.



Some of the key data on this eruption



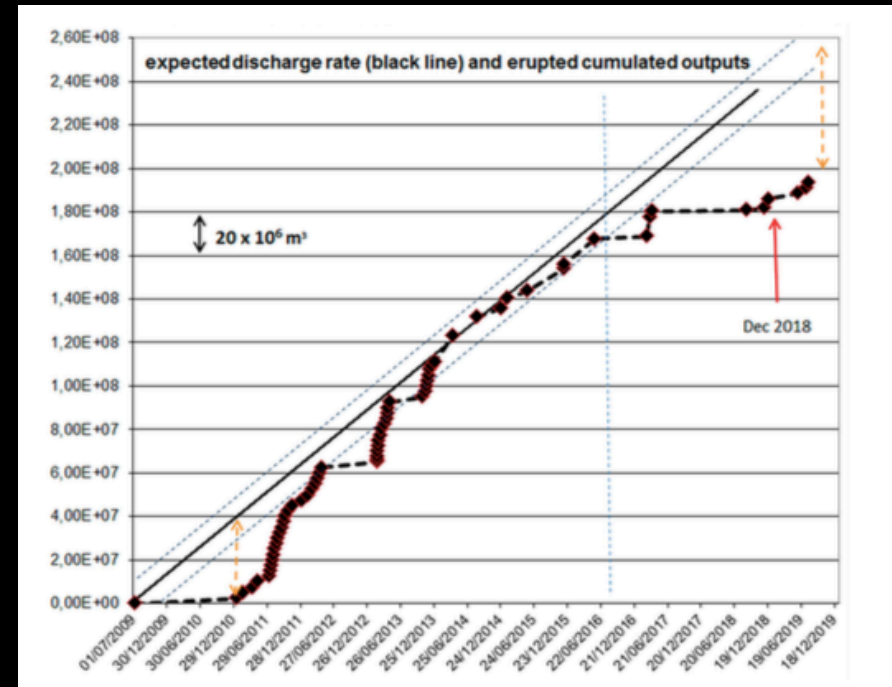
Eruptive fissure: 2300 m long
Speed of propagation: 0.7 m/s
Duration of the lava fountain: 37 minutes
Duration of the lava flows: 3 days
Lava flow field area: 0.88 km²
Max height of the lava fountain: 950 m
Max elevation of the proximal plume: 9 km a.s.l.
Max elevation of the distal plume: 13 km a.s.l.
Plume extension: 125 km
Total pyroclastic volume: $2.5 \times 10^5 \text{ m}^3$
Total lava volume: $2.5 \pm 0.7 \times 10^6 \text{ m}^3$
Max. TADR: $81 \pm 24 \text{ m}^3/\text{s}$

Conclusive remarks

The 24–27 Dec. 2018 lateral eruption occurred about ten years after the 2008-09 flank eruption, which erupted $\sim 77 \times 10^6 \text{ m}^3$ DRE volume of lava.

The 2008-09 and 2018 eruptions were similar for the intensity of the initial seismic swarm and for the localized deformations in the area of the eruptive fissures, but very different for the erupted volumes.

The estimated volume of magma accumulated within the system in 2018 and available to be erupted in the future is $\sim 50 \times 10^6 \text{ m}^3$.



Expected cumulative magma volume (black line with slope $25 \times 10^6 \text{ m}^3$ per year) and cumulative erupted volume (rhombus) at the Etna volcano in the last 10 years.

