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Driving Mechanisms Of 1651 And 2002 Eruptions At Etna Volcano (Italy)

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Mount Etna is a type case of open vent basaltic volcano. It shows a large range of eruptive styles as lava flows, Strombolian explosions, lava fountains, Subplinian and Plinian eruptions (Branca and Del Carlo, 2005), which are not usual for basaltic systems. Its frequent and sometimes violent volcanic activity poses a risk to the populated region of eastern Sicily. However, at the moment there is little understanding on the mechanisms driving explosivity and controlling eruptive styles. This issue poses strong limitations on the quantification of volcanic hazard at short and medium time scales.

To address this question we are comparing two different eruptions; one occurred in 1651 before the 1669 Montirossi eruption, which generated a large lava flow field and is characterized by large plagioclase phenocrystals and the 2002-3 eruption that was a spectacular explosive eruption accompanied by an effusive event. These two eruptions show distinct phenocryst assemblages (particularly plagioclase crystal content and size) and compositions and represent ideal end-members in the volcanic activity of Etna.

A detailed characterization of the physical properties of the lava and scoria of these two eruptions (e.g. density, vesicularity, grain size distribution and componentry) is compared with their geochemical and petrological properties (bulk and phenocryst composition, CSDs) to understand how conduit and magma chamber processes affected the eruptive dynamics. Moreover, a detailed sampling of the 2002-3 products will allow the comparison of lava and tephra erupted from the same fissural vents and will help to understand which properties in the plumbing system permits the manifestation of these two different eruptive styles.

Preliminary results for the 2002 tephra show homogeneous characteristics, unimodal grain size distribution, typical of a strombolian explosion, predominance of tachylite, and little lithic content, and allow the quantification of the textural differences between the studied eruptions. However, particles are often altered with a reddish or a yellowish alteration, the distinction between them is difficult.

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