Lava fountaining activity: the Collapsing Foam Layer Model applied to the 2000 – 2013 South-East Crater eruptive period (Mt. Etna, Italy)

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Keywords: volcanology, experimental, Mt. Etna.

Basaltic volcanoes constitute a big portion of the active volcanoes worldwide and their explosive activity, generally accompanied by eruptive columns formation and pyroclastic fallouts, produced, in the last decades, several damages on human's life with great economical and aviation impact (Scollo et al., 2009; Bonaccorso et al., 2011). Is therefore not surprising the flourishing number of studies devoted to the investigation of the link between plumbing system dynamics and eruptive style. Basaltic eruptive activity may range in a widespread spectrum from lava effusion up to rare violent Plinian eruptions. However, the most iconic explosive activities of basaltic volcanoes are represented by Strombolian explosions and lava fountains.

From 2000 to 2013 several were the episodic lava fountain eruptions taking place at South-East Crater and New South-East Crater (SEC and NSEC – Mt. Etna, Italy –) and a similar eruptive pattern (with gradual increase in explosivity marked by the passage from strombolian to fountain activity) was observed in almost all explosive events. To justify the onset, periodicity and the transition between the above-mentioned eruptive styles, different hypothesis on the degassing dynamics have been made. Here, we make use of a laboratory volcano, Mt. Etna, to test the validity of these assumptions and to calculate different volcanological parameters (e.g. erupted volume and gas flux in the plumbing system). In particular, we applied the Collapsing Foam layer (CF) model (Jaupart and Vergniolle, 1989) to the episodic lava-fountains eruptions occurred at the SEC-NSEC volcanic system between 2000 and 2013. First, we test the validity of CF model by studying the exceptional series of lava fountains observed in 2000 at SEC, with a multi-parametric approach and by assuming the CF model as the reference source model for this eruption, looking for the best parameters that allows to fit the observed pattern and eruptive behavior (e.g. intermittence time, erupted volume of lavas etc.). Secondly, we apply the CF model to three selected eruptions that took place at Mt. Etna south-eastern vents between 2000 and 2013 (the 2000, 2007-08 and 2011-13 eruptions).

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