



Eruptive Processes Leading to the Most explosive Lava fountain at Etna Volcano: The 23 November 2013 episode

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After the end of the last effusive flank eruption on 2008–2009, in January 2011 the eruptive activity resumed at Etna producing a new phase with 44 lava fountain episodes through December 2013. The paroxysmal events took place from a summit vent, the New SE Crater (NSEC), formed on the flank of the SE Crater that in the last few decades was the most active of the summit craters.

The 23 November 2013 lava fountain at Etna volcano was the most explosive of these episodes. We infer the total magma volume erupted by thermal images analysis and show that it was characterized by a very high time-averaged-discharge-rate (TADR) of ~ 360 m³/s, having erupted $\sim 1.6 \times 10^6$ m³ of dense-rock equivalent magma volume in just 45 min, which is more than 3 times the TADR observed during previous episodes. Two borehole dilatometers confirmed the eruption dynamics inferred from the thermal images. When compared to the other lava fountains, this episode can be considered as the explosive end-member. However, the erupted volume was still comparable to the other lava fountain events.

We interpret that the 23 November explosive end-member event was caused by more primitive and gas-rich magma entering the system, as demonstrated by the exceptional height reached by the lava fountain.