



The transition summit-flank activity at Mt. Etna, Sicily (Italy): inferences from the petrology of products erupted from 2007 to 2009

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Mt. Etna is an active basaltic volcano where both flank and summit eruptions take place. In particular, the South-East summit crater (SEC) during the last decades has been characterized by 'episodic' eruptions, which consist of recurrent lava fountains associated with lava flows emission, lasting from a few weeks to months. The past recent volcanic activity has shown that, if a transition from an episodic summit eruption to a flank eruption occurred, it generally took place while the last paroxysm of the episodic eruption was still underway. Differently, the 2007-08 episodic eruption at SEC was followed by the 2008-09 flank activity which started three days after the conclusion of the last paroxysm, in coincidence with the strong earthquake ($M=7.9$) in Sichuan (China), whose perturbations have been registered by the monitoring network of Mt. Etna. We then investigated the transition from summit episodic activity at SEC to flank eruption utilizing a petrologic study of the products erupted from 2007 to 2009 integrated with data from the literature. The compositional variability of the products is mainly explainable with a mixing between an evolved magma stored in the SEC reservoir and a more primitive magma which intrudes it. In the studied period the most significant episodes of magma recharge occurred before the onset of the 2007-08 episodic activity and during the 2008-09 flank eruption, more precisely before June 2008. According to previous studies the seven episodes of the 2007-08 eruption at SEC have been interpreted to result from the disruption of a foam layer at the top of the SEC reservoir which was rebuilt before each subsequent episode. The transition from 2007-08 episodic eruption at SEC to the 2008-09 flank activity was essentially triggered by the Sichuan earthquake which caused a variation of dynamic stress. It promoted the volatile exsolution, the pressurization of SEC stored magma, and the consequent fracturing of the surrounding rocks where magma intruded to be then erupted during the 2008-09 flank activity.