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Formation of lava stalactites in the master tube of the 1792–1793 flow field, Mt. Etna (Italy)

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ABSTRACT

Lava tubes are often coated with spectacular lava stalactites that are thought to form by a process of lava remelting. Here, we present results from lava stalactites collected inside a master lava tube that fed the 1792–1793 Etna flank eruption, which show features rather different from their Hawaiian or Icelandic counterparts. We analyzed three types of stalactites recognized at Mt. Etna on the basis of their morphology, and compared their features with those of the lava flow hosting the tube. Three-dimensional morphologic analyses by SEM, petrographic observations, and mineral and glass composition measured by SEM-EDS, allowed us to infer processes and conditions of stalactite formation. Our results indicate that in all the analyzed stalactites, the nature, abundance and composition of phenocrysts is similar to that of the host lava flow. This finding suggests a common mechanical origin for different types of stalactites, caused by drainage of the tube and dripping of fluid lava from the roof. However, the composition of interstitial glass is significantly different from that of the glassy groundmass measured in historical volcanic rocks of Mt. Etna and suggests that, once stalactites solidified, they were affected by a process of partial melting. Partial melting involved between 12 and 25% of the bulk rock, causing the wide compositional variation and enrichment in K_2O measured in our samples.