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Mineralogical and isotopic investigations of the 2019 Stromboli paroxysm

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The regular volcanic activity of Stromboli Volcano, Aeolian Islands, Italy, is interrupted on a decadal interval by violently explosive paroxysms [1]. In phases of normal activity the volcano erupts highly porphyritic scoria and lava (HP) with a shoshonitic basalt composition. In contrast, the paroxysmal events are characterized by the concurrent eruption of low porphyritic (LP) pumices, mingled with the HP lavas. These eruptive characteristics have been constant for centuries. Here, we provide a noval approach to characterizing the erupted materials, using scanning electron microscopy (SEM) based automated mineralogy, to investigate the textural features that occur in the mingled volcanics. High-resolution investigations revealed no evidence for diffusive chemical exchange between the mingled magmas (LP and HP), suggesting very limited interactions and no mixing of the magmas.

Furthermore, we provide radiogenic isotope data of the HP and LP components erupted in the paroxysmal event on July 3 2019. The new data suggest a return of the deep LP reservoir, following a replenishment by fresh material with low Sr isotope ratios more than 40 years ago, to the isotopic composition previously recorded for the eruption in 1931 [2-4]. In contrast, the HP lavas, which originate from a shallow reservoir, remain compositionally similar to those erupted 20 years ago. We anticipate that the Sr-isotopic signature of the HP materials (e.g. lavas and scoria) will return to a value similar to that prior to the replenishment by low-radiogenic magma some decades ago over the coming 5-10 years, following the trend observed in the LP pumices erupted in 2019.

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