

Morphological changes at Stromboli volcano, Italy, between September 2017 and September 2019 revealed by UAV

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Stromboli volcano in Italy is one of Europe's most active volcanoes, well known for its almost continuous eruptive activity. In the past decades, activity was characterized by explosions of mild to moderate intensity, emitting ash, lapilli and bombs several times per hour. At times, this activity is interrupted by more explosive paroxysms with larger erupted volumes and greater dispersal of eruptive products.

Most of the activity is limited to the crater terrace at 750 m above sea level. The number of active vents varies strongly and every explosion has the potential to change the morphology of the crater terrace. Depending on the size of the eruption these changes range from accumulation of pyroclasts, changing vent and/or crater geometry to a complete re-modelling of the entire crater terrace.

Here, we present high resolution data acquired by structure from motion photogrammetry to illustrate changes on different spatial and temporal scales. Oblique and orthophotos were acquired during several field campaigns to Stromboli in September 2017, October 2018, May 2019, June 2019 and September 2019. Our data comprise morphology changes from 'normal' activity, individual major explosions and the two paroxysms in July and August 2019.

Quantitative comparison of such high-resolution UAV data (up to 3 cm/pixel) at volcanoes with significant morphology changes is challenging and requires special processing. Eventually, comparison of topography and accordingly deposited/removed volume provides invaluable information to enhance our understanding of volcanic processes at Stromboli volcano. The observed crater and/or vent geometry changes are important input parameters for scaled laboratory experiments that investigate gas-particle jet dynamics.

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