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Rapid evolution of vent and crater morphology at Stromboli volcano

Ulrich Kueppers (1), Jacopo Taddeucci (2), Valeria Cigala (1), Nick Turner (3), Bruce Houghton (3), Daniele Andronico (4), Sebastien Biasse (3), Corrado Cimarelli (1), Mathieu Colombier (1), Elisabetta del Bello (2), Damien Gaudin (1), Marco Knüver (1), Sebastian B. Mueller (3), Alessandro Pisello (1), Piergiorgio Scarlato (2), Jörn Sesterhenn (5), Tullio Ricci (2), Pierre-Yves Tournigand (2), Brett Walker (3), and Zazà Zaía (6)

(1) Ludwig-Maximilians-Universität München (LMU), Earth and Environmental Sciences, Munich, Germany (u.kueppers@lmu.de), (2) Istituto Nazionale di Geofisica e Vulcanologia, Rome, Italy, (3) Geology & Geophysics, University of Hawai'i at Manoa, Honolulu, USA, (4) Istituto Nazionale di Geofisica e Vulcanologia, Catania, Italy, (5) Technische Universität Berlin, Berlin, Germany, (6) Magmatrek arl, Stromboli, Italy

Stromboli is a persistently active volcano, characterised predominantly by the intermittent ejection of gas and large, incandescent pyroclasts. Multiple active vents occupy a relatively flat area (hereafter called crater terrace) about 100 meters below the Pizzo vantage point at the summit of the volcano. Eruptions from the different summit vents can take place several times per hour with changing modality. During a field campaign in fall 2017, eight reconnaissance flights have been performed during six days. We used a DJI Phantom 4Pro+ to acquire high-resolution images and videos of activity at the crater terrace. At the time of observation, the northern and southwestern portion of the crater terrace were occupied by 2 and 3 clustered active vents. Due to variable eruptive activity and visibility conditions, observation were mainly focused on vent N1, the easternmost of the northern cluster. These observations were complemented with thermal infrared and visible light video recordings from the Pizzo summit. Ambient and volcanic conditions allowed flying between 5 and 250 m above the vents. These high-resolution images allow for unprecedented richness of detail of the volcanological and morphological features of the vent. The inner vent walls show a wide variability in slope angle and clast welding. N1 was a nested vent with an open conduit, approx. 1 m diameter and constant incandescence. Flights following individual eruptions permitted constraint of changes in crater morphology due to 1) pyroclast accumulation and 2) vent widening. Additionally, significant changes were revealed due to gravitational instabilities and subsidence events.
This data set allows to quantitatively describe a highly dynamic geomorphology of Stromboli's N1 vent. Information on vent geometry, wall surface roughness and clast cohesion derived by aerial images add information with unprecedented detail on what can be observed or measured (e.g. gas and pyroclast ejection dynamics, seismic acoustic signals) from the Pizzo.