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Integrating tri-stereo Pleiades images with infrared satellite data to monitor volcanoes: the 2019 Stromboli eruption

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The 3 July 2019 explosive paroxysm at Stromboli volcano (Italy) caused severe concern in the local population and media, and killed one tourist hiking the volcano. The great explosion formed a 4-km-high eruptive cloud, and its partial collapse ignited the dry vegetation and caused hot rock avalanches spreading along the northern slope to the sea and triggering a small tsunami wave. This paroxysm was followed by 56 days of lava flow effusion, and another explosive paroxysm occurred on 28 August 2019. Also this explosive event caused an eruptive column of about 4 km and hot avalanches spreading on the north flank of the volcano and on the sea surface. Here we use effusion rate time-series derived from MODIS and SLSTR data to follow the different thermal phases of this eruption and compute the dense rock equivalent volume emitted. At the same time we computed four digital elevation models from Pleiades triplets acquired on June, July, August and October 2019 in order to map the morphological changes occurred during the eruption. By differencing pre, syn and post eruptive topographies we computed the bulk lava volume at the different stages. Combining tri-stereo Pleiades results with MODIS and SLSTR ones, beside giving insights in the characterization of volcanic deposits, provides important constraints in the conversion between radiant heat flux and TADR, and demonstrates the powerful merging capability of multi-platform remote sensing data.