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Exploring closed- to open-vent conditions at twin volcanoes: Stromboli, Tinakula and Batu Tara compared by using satellite data

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Nowadays the multiple use of different satellite data allows to continuously acquire key information to monitor and investigate volcanic activity on a global scale, in particular at remote locations and poorly accessible area. In this view, we investigated the recent volcanic activity characterizing Stromboli (Italy), Tinakula (Solomon Islands) and Batu Tara (Indonesia) volcanoes by using MODIS (Moderate Resolution Imaging Spectroradiometer), ALI (Advanced Land Imager) and OMI (Ozone Monitoring Instrument) images. Basically, these three volcanic islands show striking morphostructural analogies, as i) analogue dimensions of their edifices, ii) the presence of a lateral Sciara del Fuoco-like steep depression, and iii) experienced tsunamis events induced by volcano-related processes, suggesting to define them as “twin volcanoes”.
Long-time thermal data (via MODIS sensor) and high-resolution ALI images outline an activity spanned from weakly explosive to lava effusion, with a unique VRP reliable threshold (50 MW) marking the transition from explosive to effusive regime. However, the long-lasting heat flux trends allow to track a peculiar thermal signature of the three volcanoes, also coupled with the daily sulfur concentration measured via OMI images. Stromboli dataset confirm its open-vent system behavior characterized by periodic shifting from explosive to flank effusive activity. Alternatively, we recorded the outstanding 9 year-long waxing-waning activity trend produced by the Batu Tara since January 2007 after more than 100 years of dormancy. Tinakula satellite measures indicate an intermediate condition laying between the previous two end-members, with a periodic reawakening likely promoted by high supply rate phases. These long-period thermal and sulfur data measurements highlight differences on the three eruptive behaviors, indicating a key role played by gas-rich magma in triggering eruptive activity and drawing some considerations about feeding processes and plumbing system on each volcano.
Our results outline the powerfulness of multiple satellite data acquisition for studying volcanic systems and tracking eruptive changes on poorly-investigated volcanoes characterized by Stromboli-like eruptive styles.