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Calculation of lava discharge rates during effusive eruptions: an empirical approach using MODIS Middle InfraRed data

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The rate at which the lava is erupted is a crucial parameter to be monitored during any volcanic eruption. However, its accurate and systematic measurement, throughout the whole duration of an event, remains a big challenge, also for volcanologists working on highly studied and well monitored volcanoes. The thermal approach (also known as thermal proxy) is actually one of most promising techniques adopted during effusive eruptions, since it allows to estimate Time Averaged lava Discharge Rates (TADR) from remote-sensed infrared data acquired several time per day. However, due to the complexity of the physic behind the effusive phenomenon and the difficulty to have field validations, the application of the thermal proxy is still debated and limited to few volcanoes only.
Here we present the analysis of MODIS Middle InfraRed data, collected by during several distinct eruptions, in order to show how an alternative, empirical method (called radiant density approach; Coppola et al., 2013) permit to estimate TADRs over a wide range of emplacement styles and lava compositions. We suggest that the simplicity of this empirical approach allows its rapid application during eruptive crisis, and provides the basis for more complex models based on the cooling and spreading processes of the active lava bodies.