

## Seven years of UV camera-based SO<sub>2</sub> flux observations at Mount Etna

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Volcanic SO<sub>2</sub> flux observations are relevant to understanding the magmatic processes that occur within the shallower portions of magmatic plumbing systems, and the mechanisms governing transition from open-vent quiescent degassing to explosive activity. Here, we review a SO<sub>2</sub> flux dataset acquired at Mt. Etna volcano from a permanent UV camera system during more than 7 years of observations, from June 2015 to December 2022. Our fully automated UV camera system, housed in the Montagnola INGV-OE hut, is designed to spatially resolve SO<sub>2</sub> emissions from the southern portion (SEC + Central Craters) of the summit craters' terrace. The observed period encompasses a variety of eruptive phenomena, including the Voragine Crater (VOR) paroxysmal episodes in 2015-2016, several effusive and lateral eruptions (including the late 2019 "Christmas eruption") and the two most recent paroxysmal sequences of the South-East Crater (SEC) in December 2020/April 2021 and May/October 2021. We find large temporal variations in the SO<sub>2</sub> flux in response to changes in volcanic activity style and vigour. Our results, in particular, demonstrate a clear acceleration in SO<sub>2</sub> degassing during effusive eruptions and paroxysmal episodes, relative to non-eruptive (quiescent) periods. Escalating SO<sub>2</sub> flux (>5000 t/d) is especially relevant prior (circa 1 month before) onset of the December 2020/April 2021 SEC paroxysmal sequence, whilst reduced degassing (<3000 tons/d) characterises the quiescent phases in between the paroxysmal sequences. This 2020-2021 paroxysmal sequences is characterised in more detail by complementing gas observations with volcanic tremor results and thermal output records (both ground- and satellite-based). Results are interpreted in view of a S degassing model lead that explain elevated SO<sub>2</sub> fluxes as caused by augmenting rate of magma transport into the shallow (< 5 km) Etna's plumbing system.