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Long-term monitoring of SO_2 gas flux from Stromboli, Italy, using the SO_2 camera

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All volcanic activity is driven through the exsolution, expansion and release of gas from ascending magma, and measuring gas fluxes from volcanoes is proving useful in understanding the dynamics of these systems. Changing gas concentrations and compositions reveal important changes in the volcanic system, sometimes heralding major eruptions. Gas monitoring is therefore a key discipline of volcano observatories, alongside seismicity, deformation and geological techniques. Of the volcanic gas fluxes, perhaps the easiest to measure is sulphur dioxide (SO_2) due to its high concentration in volcanic plumes, low background concentration in the atmosphere and strong UV absorption.

Automatic UV scanning spectrometers continuously monitor the SO_2 gas flux from many volcanoes, providing a constant insight into how the volcano is changing with time. These spectrometers, however, cannot properly resolve short term events, such as gas puffs and explosions.

The SO_2 camera provides a solution to this problem since it captures flux measurements at up to 1Hz. Most previous SO_2 camera measurements are limited to short term campaign deployments, with a small number of exceptions including Kilauea, so are unable to capture longer term variations of the volcanoes. Here, we analyse SO_2 camera footage from several weeks in 2013 at Stromboli to observe how the short term events change over time. We measure the proportions of gas emitted through passive degassing, puffing and explosions, and perform Fourier analysis on the flux measurements to observe dominant frequencies in the gas emissions. Shifting the SO_2 camera from short-term deployment equipment to permanent installation will give greater time resolution compared to current long term volcanic gas monitoring techniques, potentially revealing phenomena that could be helpful in predicting eruptions.