



The effect of light dilution on different calibration techniques for the SO₂ camera

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Monitoring volcanic gas composition and emission rates can reveal precursors to eruptions and magmatic processes occurring at depth. The coupling/decoupling of gas and magma plays a major control on the style of eruptive activity, and each gas has a unique solubility-pressure relationship, thus providing rich constraints on sub-surface processes. Accurate quantification of gas fluxes together with measurements of volatile contents can provide insights into the mass and volume of magma supply. The most common method for measuring SO₂ flux from volcanoes is scanning across, or traversing beneath, a plume using miniature spectrometers and analysing the spectra using DOAS. This technique can provide highly precise and accurate flux quantifications, but generally lack temporal resolution.

A newer approach is the SO₂ camera, which can capture images of SO₂ in the plume up to several times a second. Accurate quantification can be difficult, however, as the camera must be calibrated using SO₂ cells of a known gas amount or with a co-located spectrometer. The exact value of the calibration will vary when there is a high concentration of gas in the plume, and with changes in the atmosphere and solar illumination.

We compare measurements from two UV cameras with simultaneous spectrometer traverses at Masaya volcano, Nicaragua, to assess how two calibration methods perform. We find up to a factor of three difference between the two calibration methods when not accounting for light dilution, with spectrometer-calibrated camera fluxes significantly underestimating the true flux. From this, we conclude that techniques for correcting light dilution must be tailored to the specific calibration method used.