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Corrections for SO2 fluxes by radiative transfer investigations in volcanic plumes

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Today SO2 fluxes achieved by scanning DOAS instruments are often calculated very roughly by using geometrical considerations. It is a commonly applied method, but can result in high errors, especially for complex volcanic plumes. Moreover, often volcanic plumes are accompanied by smoke and/or clouds, which can either mask parts of the plume or even enhance the absorption path due to multiple scattering. Thus, an underestimation as well as an overestimation of the flux of a volcanic plume is possible if simple geometrical calculations are used.

Besides molecular oxygen, the oxygen dimer (O4) is a well known and during the last years increasingly applied indicator for the radiative transport and therefore also for the length of light path. The concentration of O4 is proportional to the square of the O2 concentration and therefore only small variations in the atmospheric column exist.

DOAS observations of volcanic plumes allow, in addition to the simultaneous observation of various trace gases, also the observation of the O4 absorption. From such measurements, the light paths can be characterised and the effects on the measured trace gases can be quantified.

We discuss the still insuffciently investigated topic of radiative transfer in volcanic plumes and demonstrate the potential of the O2 and O4 absorption as an indicator of the lightpathes in volcanic plumes.

A measurement example of the O4 as an indicator of light path elongation, which illustrates the possible overestimation for an SO_2 flux measurements with the scanning MAX-DOAS-sytem will be given.