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Comparing and integrating SO2 measurements from ground and space.

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Sulphur dioxide (SO2) is a key parameter to measure when monitoring active volcanoes. Over the past 10 years our ability to measure SO2 emissions from volcanoes has been improved significantly thanks to the appearance of 3 technological developments: (i) the generalization of small portable UV spectrometers (e.g. Galle et al, 2003) for measuring SO2 with the DOAS technique. These spectrometers were adapted and automated to be deployed as networks around volcanic edifices, in order to ensure permanent monitoring of their SO2 flux; (ii) the launch of ASTER (Pieri and Abrahms, 2002), a multispectral satellite sensor, whose bands in the thermal infrared are sensitive to SO2 absorption with an unprecedented ground resolution of 90m; (iii) the launch of OMI (Levelt et al., 2006), an imaging spectrometer that measures the backscattered ultra violet (BUV) radiance. With its nearly global coverage and high sensitivity, OMI has become the paradigm of SO2 observation from the space.

We present results of cross validation of these three methods over a number of volcanic plumes (Etna, Popocatépetl, Turrialba, Masaya, Eyjafjallajokull, Nyiragongo, Nyamuragira, Anatahan) located in different atmospheric settings. These comparisons show a generally good agreement between all three methods, with some well identified limitations intrinsic to each of them. This study also demonstrates that the three methods complement one another and can provide original information for volcano monitoring.