

Three-years of SO₂ flux measurements of Mt. Etna using an automated UV scanner array: comparison with conventional traverses and uncertainties in flux retrieval

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Abstract

Routine measurements of SO₂ flux using the traverse method on Mt. Etna (Italy) were augmented in late 2004 when an array of automatic scanning ultraviolet spectrometers was installed. Each instrument allows one SO₂ scan to be recorded every ~6 min. Here we report the methods that we developed to automatically and robustly transform SO₂ profiles into SO₂ flux data. Radian geometry and Fast Fourier Transform algorithm were used for reducing plume cross sections and for discriminating between volcanic plumes from those produced by water vapour clouds. Uncertainty in flux measurements depends on the accuracy of plume-height estimation, on assumptions concerning plume-geometry, and on the quality of the retrieved SO₂ amounts. We compare 3 years of flux measurements made using both the automated network and “conventional” traverse methods beneath the plume. We found a good agreement between the datasets, both in terms of magnitude and in temporal variations. These results validate the Etna SO₂ flux monitoring system. Emission rates are available to the 24-hour manned operations room via intranet, providing real-time information on degassing rates and plume location.