



## Comparisons of satellite and ground-based sulfur dioxide retrievals

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Quantifying SO<sub>2</sub> burdens emitted from a volcano is critical to understanding a volcano's current state of activity. Currently, several methods are used to quantify the SO<sub>2</sub> output of degassing volcanoes. Ground and aerial-based measurements (mini-DOAS and COSPEC) provide in-situ estimates of SO<sub>2</sub> output. Satellite-based measurements have increasingly been used as a tool for volcanic monitoring. Direct Broadcast real-time processing of remotely sensed data from NASA's Earth Observing System (EOS) satellites (MODIS Terra and Aqua) presents volcanologists with a range of spectral bands and processing options for the study of volcanic emissions.

A key question is how well do MODIS SO<sub>2</sub> estimates compare with DOAS and COSPEC estimates? In 2003 and 2004 ground-based plume measurements were collected at Anatahan volcano (16.35N, 145.67E) in the Mariana Islands (Fischer and Hilton). SO<sub>2</sub> retrievals for these same dates were calculated using MODIS images and the Map\_SO<sub>2</sub> retrieval program (Realmuto). MODIS was able to clearly detect the plume and Map\_SO<sub>2</sub> derived fluxes were calculated to be 10,000 to 20,000 t/d depending on the plume altitude used in the program. The COSPEC derived flux was between 3,000 and 4,500 t/d. The COSPEC profile recorded higher SO<sub>2</sub> concentrations on the plume edge with a decrease in concentration in the transect center while transects derived from the MODIS/Map\_SO<sub>2</sub> program show a concentration peak in the transect center. It is possible that due to the coarse resolution of MODIS the center of the plume is being overestimated. A 2nd order polynomial was fit to the high points of the COSPEC profile to model a possible overestimation by MODIS. Using the modeled profile a new flux was calculated to be 5028 to 7445 t/d.