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Volcanic plume evolution through the MSG-SEVIRI thermal infrared data: the 24 November 2006 Mt. Etna tropospheric eruption.

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The high frequency of Spin Enhanced Visible and Infrared Imager (SEVIRI) acquisition (one image every 15 minutes) and the data characteristics enable not only a close qualitative monitoring of volcanoes, but also the quantitative retrieval of many physical parameters keys in the volcanic activity description and understanding. In this work we show the results of the SEVIRI thermal infrared data processing applied to the SEVIRI data set collected during the 24 November 2006 Mt. Etna tropospheric eruption.
SEVIRI sensor is an optical imaging radiometer aboard on the geosyncronous meteorological satellite MSG (Meteosat Second Generation). It is characterized by 12 spectral channels, a high temporal resolution, and a 10 km2 footprint. The instrument's spectral range includes the 7.3 and 8.7 micron SO2 absorption bands and the 10.8 and 12.0 micron split window bands affected by volcanic ash absorption.
The volcanic ash plume total mass, effective radius and aerosol optical thickness maps, the SO2 plume columnar abundance, the SO2 and ash interference in the retrievals, SO2 and ash fluxes and more general characteristics like plume speed, direction, and height have been evaluated on each image of the data set. The SO2 and ash retrievals have been carried out by means of a Look-Up Table (LUT) least squares fit procedure, where the LUT has been builded using MODTRAN 4 radiative transfer model simulations with an input atmosphere modeled by means of the WMO Trapani meteo station atmospheric profiles. The plumes of SO2 and ash have been input in the simulations as layers of varying SO2 concentration, ash optical properties, thicknesses and heights.
The SEVIRI SO2 retrieval shows a significant columnar abundance overestimation when the relevant ash presence in the plume is neglected. Our results are compared with those obtained by processing the data collected during the same eruption by AIRS, MODIS, and OMI satellite sensors.