



Volcanic Cloud Retrieval and Eruption Characterization: The 3-5 December 2015 Etna Lava Fountain

Dario Stelitano, Stefano Corradini, Luca Merucci, and Lorenzo Guerrieri
INGV, ONT - Remote Sensing Group, Rome, Italy (dario.stelitano@ingv.it)

The Mt. Etna, Italy, eruption occurred in the period between 3 and 5 December 2015 is the biggest of the last twenty years. The Voragine crater has formed eruption columns higher than 12-14 km asl that reached the stratosphere and produced copious tephra fallout on volcano flanks. The high water vapour content present in the volcanic cloud, together with the high altitude reached by the column, lead to a formation of a dense ice cloud.

In this work the measurements of MSG_SEVIRI are used to entirely characterize the volcanic emission by estimate the volcanic cloud parameter as SO_2 mass and optical depth, effective radius and mass of ash and ice particles.

Spinning Enhanced Visible and Infrared Imager (SEVIRI) is a multispectral sensor on board the current Meteosat Second Generation (MSG) EUMETSAT satellites having the capability to acquire images in 12 spectral channels with a nadir spatial resolution of 3 km every 15 min in full Earth scan mode or 5 min in rapid scan mode (only over Europe and North Africa).

The discrimination between volcanic cloud ice and ash species is realized by applying the Brightness Temperature Difference (BTD) approach. A sensitivity analysis due to the choice of the BTD threshold is also realized.

Another critical parameter for volcanic cloud retrievals estimations and eruption characterization is the volcanic cloud altitude. MODIS is a multispectral radiometer on board the NASA Terra (EOS-AM) and Aqua (EOS-PM) polar platforms. MODIS has 36 spectral channels with a nadir spatial resolution from 250 m in the visible channels and 1 km for the thermal infrared (TIR) channels.

Here a new integration procedure is presented to exploit the different retrieval realized by different GEO-LEO sensors and different techniques to significantly improve the altitude estimation.

All the products described in this work are used to evaluate, in real time, the impact of the volcanic eruptions on atmosphere in order to support the Civil Protection and air-space traffic managers on their decision making processes.