



Volcanic ash and SO₂ retrievals from TIR multispectral satellite measurements: comparison between LUT, NN and VPR approaches

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The 2010 Eyjafjallajökull eruption made evident the need to obtain more accurate volcanic ash and SO₂ quantitative estimations in a near real time basis. These pressing requirements forced the scientific community to develop novel retrieval approaches and inter-comparison exercises.

In this work the ash and SO₂ retrievals obtained by applying three different algorithms (LUT, NN, VPR) on MODIS TIR measurements have been compared.

The LUT (Look Up Table) procedure [Corradini et al., 2009] is based on the comparison between the measured radiances and the simulated top of atmosphere (TOA) radiances using radiative transfer models (RTM). The NN (Neural Network) approach [Picchiani et al., 2011] consists in two separate steps: at first the ash detection is reduced to a classification problem and the ash mass retrieval is realized by replicating the LUT model performances. The VPR (Volcanic Plume Removal) procedure [Pugnaghi et al., 2013] is based on the volcanic cloud signal removal from the multispectral TIR image by substituting the radiance values in the plume region with the background radiance obtained by linear interpolation of the radiance measured in the area surrounding the plume. The knowledge of the plume temperature and altitude, together with the original radiance and the aforementioned background radiance, allows the computation of the plume transmittances in the MODIS TIR channels from which the ash and SO₂ retrieval are carried out.

As test case some events of the 2011-2013 Etna lava fountain activity are considered. Advantage and drawbacks of the different procedures have been also addressed.

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