Geophysical Research Abstracts
Vol. 15, EGU2013-8650, 2013
EGU General Assembly 2013

Effect of the volcanic ash type uncertainties on ash and SO_2 retrievals from satellite multi-spectral measurements in the TIR spectral range

Stefano Corradini (1), Luca Merucci (1), Robin Campion (2), and Elisa Carboni (3)

(1) Istituto Nazionale di Geofisica e Vulcanologia (INGV), Rome, Italy (stefano.corradini@ingv.it), (2) Université Libre de Bruxelles, Belgium, (3) AOPP, University of Oxford, UK

After the Eyjafjallajokull 2010 eruption the quantitative determination of the volcanic ash present in ash clouds has become more important because of the policy change from the previous zero tolerance to the new ash threshold based approach in the aviation hazard management.
Volcanic SO_2 has an impact on the environment and when injected at high altitudes can be oxidized to form sulphates capable of reflecting solar radiation then causing surface cooling. Observations of the volcanic degassing also yield insights into the magmatic processes which control volcanic activity during both quiescent and eruptive phases.
During volcanic eruptions ash and gases are often emitted simultaneously. The plume ash particles reduce the top of atmosphere radiance in the entire thermal infrared (TIR) spectral range causing a significant SO_2 columnar abundance overestimation. The ash optical properties are among the most critical parameters to set, their uncertainties cause meaningful errors on both ash and SO_2 retrievals.
In this work the effect effect of the volcanic ash type uncertainties on ash and SO_2 retrievals from MODIS measurements in the TIR spectral range have been quantified. As test case some events of the 2010 Eyjafjallajokull (Iceland) eruption has been considered. The ash optical properties derive from the ARIA database of the Oxford University, while the MODIS SO_2 and ash retrievals strategies are based on the BTD and minimization approaches using the channels centered at 8.7, 11 and 12 micron. The radiative transfer model simulations, needed for the retrievals schemes, are carried out by using MODTRAN [Corradini et al., 2009].
The MODIS SO_2 retrievals have been also compared with the retrievals obtained by using IASI hyper-spectral and ASTER high spatial resolution data. The two procedures are considered less sensitive to the ash type: the ASTER retrieval scheme [Campion et al. 2010] consists of adjusting the SO_2 column amount until the ratios of radiance simulated on several ASTER bands match the observations, while the IASI retrieval [Carboni et al. 2012] is an optimal estimation scheme that exploit the high resolution spectrometer measurements of the two SO_2 absorption bands around 7.3 and 8.7 micron.