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Satellite remote sensing of volcanic plume from Infrared Atmospheric Sounding Interferometer (IASI): results for recent eruptions.

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The IASI high resolution infrared spectra is exploited to study volcanic emission of ash and sulphur dioxide (SO_2). IASI is a Fourier transform spectrometer that covers the spectral range 645 to 2760 cm-1 (3.62-15.5 μm). The IASI field of view consists of four circles of 12 km inside a square of 50 x 50 km, and nominally it can achieve global coverage in 12 hours.
The thermal infrared spectra of volcanic plumes shows a rapid variation with wavelength due to absorption lines from atmospheric and volcanic gases as well as broad scale features principally due to particulate absorption.
IASI spectra also contain information about the atmospheric profile (temperature, gases, aerosol and cloud) and radiative properties of the surface. In particular the ash signature depends on the composition and size distribution of ash particles as well on their altitude. The sulphur dioxide signature depends on SO_2 amount and vertical profile.
The results from a new algorithm for the retrieval of sulphur dioxide (SO_2) from the Infrared Atmospheric Sounding Interferometer (IASI) data will be presented. The SO_2 retrieval follows the method of Carboni et al. (2012) and retrieves SO_2 amount and altitude together with a pixel by pixel comprehensive error budget analysis.
IASI brightness temperature spectra are analysed, to retrieve ash properties, using an optimal estimation retrieval scheme and a forward model based on RTTOV. The RTTOV output for a clean atmosphere (containing gas but not cloud or aerosol/ash) will be combined with an ash layer using the same scheme as for the Oxford-RAL Retrieval of Aerosol and Cloud (ORAC) algorithm.
We exploit the IASI measurements in the atmospheric window spectral range together with the SO_2 absorption bands (at 7.3 and 8.7 μm) to study the evolution of ash and SO_2 volcanic plume for recent volcanic eruptions case studies.
Particular importance is given to investigation of mismatching between the forward model and IASI measurements which can be due, for example, to imperfect knowledge of ash optical properties.