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SO2 and ash simultaneous retrievals on 2010 Eyjafjallajökull eruption by using IR multispectral measurements. Insights into explosive volcanic processes.

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The 2010 April-May Eyjafjallajökull eruption caused an unprecedented disruption to economical activities in Europe. The air traffic was interrupted several times to avoid the hazard represented by the dense clouds of volcanic ash released into the atmosphere.
The use of satellite measurements has been proved to be crucial for the real time monitoring of the volcanic activity and has produced useful and reliable information to the decision makers during the whole crisis. A thorough study of the satellite data can also provide novel insights into the eruption evolution and mechanism.
In this work the Thermal InfraRed (TIR) measurements of the Moderate Resolution Imaging Spectroradiometer (MODIS) have been used to retrieve simultaneously the volcanic ash and SO2 in the entire eruption period over Iceland.
The ash retrievals (mass, ash optical thickness and effective radius) have been carried out by using the BTD technique considering the channels centered around 11 and 12 microns. The SO2 is retrieved by using both the channels centered around 7.3 and 8.7 microns. A correction procedure for the effect of volcanic ash on SO2 8.7 microns retrieval is also applied.
The volcanic plume column altitude, the ash cloud density and the ash emission rate have been also retrieved and compared, when available, with ground observations and model estimations.
Our results confirm the MODIS ability to monitor the eruption evolution and to identify the different eruption phases. Moreover, they provide insights into the eruption processes through the analysis of the volcanic ash and gas emissions.