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Secondary sulphate aerosols and cirrus clouds detection with SEVIRI during Nabro volcano eruption

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Explosive volcanic eruptions can perturb the upper tropospheric and stratospheric aerosols by the injection of volatile sulphur compounds, like sulphur dioxide, and the subsequent conversion to secondary sulphate aerosols (SSA). The volcanically-produced sulphates can act as ice nuclei, at these altitudes, and modify the occurrence and microphysical/optical properties of cirrus clouds in the upper-troposphere. Sulphate aerosols and cirrus clouds have an impact on the Earth's radiation budget from the regional to the global scale, and then on the Earth's climate.

The Nabro volcano (Eritrea, 13.37°N, 41.70°E) erupted violently on 12 June 2011. The eruption, which lasted almost 1 month, is responsible for the most important injection of sulfur dioxide in the upper-troposphere and stratosphere since the eruption of Mount Pinatubo (1991), significantly perturbing the aerosol layer at these altitudes. The detailed study of this eruption and its atmospheric impact is of particular interest because this event is spatially and temporally coincident with the Asian summer monsoon dynamics, during 2011. The volcanic effluents were captured in the monsoon anticyclone; the interaction of the eruption with the monsoon dynamics is debated and still not clear.

In this contribution, we present new SSA measurements, based on the work of Sellitto and Legras (2015), and cirrus clouds classification (Derrien and LeGléau, 2005), using SEVIRI (Spinning Enhanced Visible and Infrared Imager) observations. We use these observations to characterize the evolution of Nabro eruption at a very high temporal resolution. The role of the volcanic SSA on the occurrence of cirrus clouds at the regional scale is also analysed and discussed for this event.

References:
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