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The effects of Mt Etna eruption of 25-28 October 2013 on the atmospheric chemistry and aerosols in the Mediterranean

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Volcanic eruptions can influence the tropospheric and stratospheric composition and the Earth's radiation budget. While the effect of strong explosive eruptions affects also the stratosphere on hemispheric and global scale, the spatial extent of the tropospheric perturbation due to weaker activity can be variable. Small volcanic eruptions may potentially affect tropospheric composition at relatively distant locations, depending on the emissions and the local dynamics. One of the most important effects on the tropospheric composition is the impact on the aerosol distribution, following the conversion of the emitted sulphur dioxide to sulphate aerosols.

Here we present a study aimed at identifying the possible effects of the Mt Etna activity on the aerosol composition and the sulphate aerosol content in the Southern part of the Central Mediterranean. This study is based on aerosols and sulphur dioxide measurements made at the ENEA Station for Climate Observations (35.5° N, 12.6°E, 50 m asl) on the island of Lampedusa, and on an array of satellite observations, including UV and TIR sensors like IASI and OMI, and the space-borne Lidar CALIOP. The recent Mt. Etna activity occurred on 25-28 October 2013 has been selected as a case study, as the resulting sulphur dioxide plume has reached locations as far as Lampedusa. As a support to the identification of Mt Etna's impact on the sulphate aerosol content in that area, we perform trajectory analyses by means of a Lagrangian scheme coupled with a chemical box models to describe the chemical transformation of emitted sulphur dioxide to sulphate aerosols. Starting from this case study, we try to systematically determine the impact of the Mt Etna activity in this section of the Mediterranean, by matching the long-term ground measurements at Lampedusa with information of the Etna activity.