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Synergistic use of Lagrangian modelling, satellite- and ground-based measurements for the investigation of volcanic plumes evolution and their impact on the downwind aerosol optical and micro-physical properties: the Etna eruption of 26-27/10/2013

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In this contribution we show how the combined use of SO_2/ash plume dispersion modelling and remote observations from satellite and ground can be used to study the influence of moderate volcanic activity on the optical and micro-physical characterization of the tropospheric aerosol layer at the regional scale. We analyze the Mount Etna lava fountain and gas/ash emission episode of 26-27/10/2013. This study is based on aerosol and SO_2 measurements made at the ENEA Station for Climate Observations (35.52°N, 12.63°E, 50 m asl) on Lampedusa island, on satellite observations, and on a Lagrangian model analysis. The used satellite dataset includes MODIS (MODerate resolution Imaging Spectroradiometer) true colour images, volcanic SO_2/ash retrievals and flux estimations, and SEVIRI (Spinning Enhanced Visible and InfraRed Imager) cloud top pressure estimations. Trajectory analyses are made with the FLEXPART (FLEXible PARTicle dispersion model) Lagrangian dispersion model. The combination of MODIS and SEVIRI observations, FLEXPART simulations, and ground-based observations at Lampedusa indicate that SO_2 and ash, despite the initial injection at about 7.0 km altitude, could have reached up to 10.0-12.0 km altitude, and influenced the aerosols size distribution downwind at a ground station, at more than 350 km distance, in the Southern sector of the Central Mediterranean. This study indicates that even a relatively small volcanic eruption can have an observable effect on the aerosol layer at the regional scale. Some arguments are given on the likely impact of the secondary sulphate aerosols formed from the conversion of the emitted SO_2 on the aerosol size distribution at Lampedusa.