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SMED - Sulphur MEditerranean Dispersion

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Emissions of volcanic gases and particles can have profound impacts on terrestrial environment, atmospheric composition, climate forcing, and then on human health at various temporal and spatial scales. Volcanic emissions have been identified as one of the largest sources of uncertainty in our understanding of recent climate change trends. In particular, a primary role is acted by sulphur dioxide emission due to its conversion to volcanic sulphate aerosol via atmospheric oxidation. Aerosols may play a key role in the radiative budget and then in photochemistry and tropospheric composition. Mt. Etna is one of the most prodigious and persistent emitters of gasses and particles on Earth, accounting for about 10% of global average volcanic emission of CO_2 and SO_2. Its sulphur emissions stand for 0.7 $\times$ 106 t S/yr9 and then about 10 times bigger than anthropogenic sulphur emissions in the Mediterranean area. Centrepiece of the SMED project is to advance the understanding of volcanogenic sulphur dioxide and sulphate aerosol particles dispersion and radiative impact on the downwind Mediterranean region by an integrated approach between ground- and space-based observations and modelling. Research is addressed by exploring the potential relationship between proximal SO_2 flux and aerosol measured remotely in the volcanic plume of Mt. Etna between 2000 and 2014 and distal aerosol ground-based measurements in Lampedusa, Greece, and Malta from AERONET network. Ground data are combined with satellite multispectral polar and geostationary imagers able to detect and retrieve volcanic ash and SO_2. The high repetition time of SEVIRI (15 minutes) will ensure the potential opportunity to follow the entire evolution of the volcanic cloud, while, the higher spatial resolution of MODIS (1x1 km2), are exploited for investigating the probability to retrieve volcanic SO_2 abundances from passive degassing. Ground and space observations are complemented with atmospheric Lagrangian model (FLEXPART) for inspecting the transport and dispersion of volcanic plume over the Mediterranean region and the radiative transfer model UVSPEC for inspecting radiative forcing of volcanic sulphates over the Mediterranean region. Preliminary results exploring the Central-Southern Mediterranean, reveal that thought only 2 -7% of Mt. Etna's volcanic clouds disperses over this region, volcanic impact might be relevant in both SO_2 abundances and sulphate-volcanogenic derived aerosol.