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Tropospheric transport of volcanic aerosol in the Mediterranean area: a case study based on the 2002 Etna eruption

F. Tampieri for etna-2002 team
Istituto di Scienze dell'Atmosfera e del Clima CNR, Bologna, Italy

The presence of aerosols in the troposphere affects meteorology, air quality and climate. Detection and simulation of transport is a fundamental step towards understanding and predicting their effects.

In this paper we discuss a combined approach based on lidar observations (made in the framework of EARLINET) and meteorological modelling, to describe cases of transport of volcanic ash emitted from Etna volcano, over the Mediterranenan basin and Southern Europe [Pappalardo et al., 2004]. Lidar measurements allow one to detect the presence, the height and thickness of aerosol layer(s). To some extent, a guess on the chemical composition of the observed particles can be made. The set of observations leads to a series of 'local snapshots': we discuss cases in the period from 28 October to 15 November 2002.

The transport model (based on BOLAM meteorological model and a Lagrangian stochastic forward trajectory model) simulates the transport and dispersion, given a guess about the source characteristics [Buzzi et al., 2003; Leherman, 1993; Schultz, 1995; Kain and Fritsch, 1990]. The meteorological input comes from ECMWF analyses. Some dispersion parameters have been defined from previous studies of tropospheric transport.

The comparison between observations and simulations allows us to one hand to detect situations and places where volcanic aerosol is transported directly from the source, and to the other hand to confirm the absence of such particles [Tiesi et al., 2004]. Some discrimination between different sources (volcanic vs. desertic aerosol) can also be made.

In general, the integrated method offers a powerful tool for interpretation of data and of forecast of events. The specific cases investigated put also into evidence some critical points to be tackled in the future.

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