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Characterisation of Saharan dust events over the Iberian Peninsula: LIDAR, sun photometer and DREAM model simulations

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Due to its proximity to North Africa, the Western Mediterranean area is strongly affected by the presence of Saharan dust. In the last years, a number of studies have focused on understanding the different phases of the dust process (mobilisation, transport, deposition and climate interactions) over the Mediterranean and Europe based on satellite imaging (eg. Moulin et al 1997), in-situ measurements of depositions, concentrations and optical depths (eg. Loye-Pilot and Martin, 1996; Rodriguez et al., 2001), lidar observations (eg. Gobbi et al., 2000; Ansmann et al., 2003) and modelling (eg. Nickovic et al., 2001).

The Barcelona lidar station (41º 23' N, 2º 07' E, 60 m a.s.l.) is located on the western shores of the Mediterranean Sea, on the northeastern corner of the Iberian Peninsula (IP). In the frame of European project EARLINET (European Aerosol Research Lidar Network), from May 2000 to December 2002, 25 episodes were successfully monitored under Saharan dust outbreaks which were previously forecasted using the models available on the world wide web (SKIRON, DREAM, NAAPS). In 2004, 8 episodes were also followed. Lidar measurements concerned the retrieval of the vertical profiles of the aerosol backscatter coefficient at 532 nm and 1064 nm using the Klett inversion technique.

This contribution analyses 4 years (2000, 2001, 2002 and 2004) of Saharan dust events towards the IP in terms of meteorological patterns, model calculations, lidar observations, sun-photometer data and satellite imagery. In addition, detailed analysis of a long episode (11- 30 June 2002) is performed. Synoptic charts and satellite imagery are used to explain the weather conditions and air flow patterns which induced the export of dust-rich air masses towards south-western Europe. Model calculations with the operational Dust Regional Atmospheric Modelling (DREAM) (http://www.icod.org) (Nickovic et al., 2001) are presented together with intensive backscatter lidar observations performed over the Barcelona region (Western Mediterranean Basin). Data from an AERONET sun-photometer at El Arenosillo is used as well to complement some optical properties of the Saharan dust plume. Concentration profiles are estimated from backscatter profiles using sun-photometer data and the aerosol model OPAC in order to perform a detailed vertical comparison with regional dust modelling.

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