Saharan Air Layer (SAL) over Tenerife: Summertime statistic analysis from lidar measurements

C. Córdoba-Jabonero[1], D. Toledo[1], J.A. Adame[1], Y. Hernández[2], E. Cuevas[2] and M. Gil[1]

[1]Instituto Nacional de Técnica Aeroespacial (INTA), Atmospheric Research and Instrumentation Branch, Torrejón de Ardoz, 28850, Madrid, Spain
[2]Agencia Estatal de Meteorología (AEMET), Atmospheric Research Centre of Izaña, Sta. Cruz de Tenerife, Spain
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Presenting author email: cordobajc@inta.es

The vertical distribution of dust is a key parameter on aerosol-ozone-UV interactions (i.e., Bonasoni *et al.*, 2004) for atmospheric radiative forcing assessment and climate-related studies (IPCC, 2007). Despite of a great attention has been paid in last years to the aerosols in a global scale and, in particular, to the Saharan dust, a large uncertainty on the sign of the radiative forcing still remains. In addition, height-resolved information of the dust properties is also required in other frameworks as for aerosol forecast modeling (i.e., Pérez *et al.*, 2006) and satellite data validation (i.e., Pappalardo *et al.*, 2010).

Canary Islands offer the most promising site as located downwind of the Saharan outbreaks sources for dust monitoring. The arrival of dust plumes to that area is a common feature, more frequently observed in summertime and extended up to high altitudes, resulting from strong convective activity over the Sahara desert under favorable meteorological conditions. The vertical characterization of individual dust events is significant for the determination of the so-called Saharan Air Layer (SAL), identified as a mass of warm, dusty and dry air which forms over the Saharan desert, in order to evaluate the climate impact of such phenomena, even at local scales.

In general, the synergy between lidar and sun-photometry observations is also widely used for dust research (i.e., Müller *et al.*, 2003; Mona *et al.*, 2006; Papayannis *et al.*, 2008; Córdoba-Jabonero *et al.*, 2011). Since 2005 height-resolved measurements are routinely performed at the AEMET/Santa Cruz de Tenerife subtropical station (SCO, 28.5ºN 16.2ºW, 52 m a.s.l.) by using a Micro Pulse Lidar v. 3 (MPL-3) within the NASA/MPLNET (Micro Pulse Lidar NETwork). SCO is also an AERONET (Aerosol Robotic NETwork) site.

In this work we present the statistical results of the SAL characterization in summertime over SCO from routine lidar measurements. This study focuses on vertical features (single/multi-layered structure, top height, among others) of the dusty episodes, in addition to other optical properties (Free-Tropospheric dust contribution to the total AOD, Lidar Ratio frequency, etc.). Air masses backtrajectory analysis completes this study. For instance, the SAL is examined for a strong dust intrusion occurring on 21 July 2009 over SCO (see Figure 1). Extinction coefficients are retrieved considering a pure dust scenario (Córdoba-Jabonero *et al.*, 2010) and a Lidar Ratio of 55 sr is found. In this case, daily SAL top is ranging between 5.3 and 5.7 km, and a FT dust contribution of 88.3% is calculated.

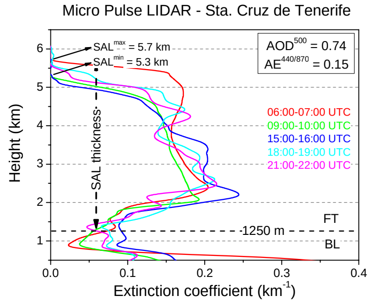

Figure 1. Dust extinction coefficients on 21 July 2009, for instance, over SCO site.

This summertime statistic analysis represents a relevant advance on SAL characterization in aerosol stations fairly close to dust emissions. Moreover, these results can be directly applied to the evaluation of the ozone vertical depletion observed under Saharan dust events (Andrey *et al.*, 2010) and the changes experienced by minor halogen species involved in ozone chemistry.

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Andrey *et al.* (2010) *International Aerosol Conference*, 29 August-3 September, 2010, Helsinki, Finland.

Bonasoni *et al.* (2004) *Atmos. Chem. Phys.* **4**, 1201-1215.

Córdoba-Jabonero *et al.* (2010) *IV Spanish Meeting on Aerosol Research and Technology*, Abstract extended, G31-G35.

Córdoba-Jabonero *et al.* (2011) *Atmos. Chem. Phys.* **11**, 3067-3091.

IPCC 2007 *Intergovernmental Panel on Climate Change*, Geneva, 210 pp., 2008.

Mona *et al.* (2006) *J. Geophys. Res.* **111**, D16203, doi:10.1029/2005JD006569.

Müller *et al.* (2003) *J. Geophys. Res.* **108**, 4345, doi:10.1029/2002JD002918.

Papayannis *et al.* (2008) *J. Geophys. Res.* **113**, D10204, doi:10.1029/2007JD009028.

Pappalardo *et al.* (2010) *J. Geophys. Res.* **115**, D00H19, doi:10.1029/2009JD012147.

Pérez *et al.* (2006) *J. Geophys. Res.* **111**, D15214, doi:10.1029/2005JD006579.