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Towards the assessment of the vertical structure of Saharan dust over SE Spain from rawinsonde data

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Radiosonde measurements are important for a large variety of meteorological and climate applications. Even though other instruments, like the lidar, have much higher vertical and temporal resolution, availability of a large radiosonde database offers the opportunity to study long term series at many locations around the world. We have studied the operational radiosounding retrievals at the Murcia station (38.00^0N 1.17^0W, 62 m a.s.l.) to further understand the vertical structure of the dust transport over SE Spain and its effect in the area.

A number of works have used radiosonde data to establish the criteria to extract a mixing height (MH) climatology from the lidar signal. De Tomasi Perrone (*Atmos. Res.* 80, 86-103, 2006) used the derivative of the backscatter coefficient (BSC) profiles to define (by its first and second maxima) the heights of the planetary boundary layer and the dust layer (DL). These authors have found good correlation between the minima of the derivative of the BSC and the maxima of the derivative of the potential temperature (THTA) profiles. That would provide a tool to obtain some properties of the vertical profile of the dust transport from radiosoundings.

African dust represents a large fraction of the tropospheric aerosols advected to the western Mediterranean basin. Events of long range transport to the study area (African dust outbreaks, ADOs) were identified by aerosol transport models, back-trajectories and satellite imagery.

Considering only days with convective conditions and influenced by ADOs in the period $2002 - 2004$, we have firstly compared the height of the first maximum of the derivative of THTA with the daytime MH using the parcel and the bulk Richardson number methods. Secondly, we have studied with back-trajectories the possible origin of the dust layers found in upper levels.

In a fraction of the days the agreement between the parcel and Richardson MH and the height of the first maximum of the derivative of THTA was excellent; moreover, the upper level dust layers were easily identified. However, in more than a half of the days *(i)* an aerosol layer appears on top of the PBL coupled to it and the computed MH values show differences; or *(ii)* there exist many small peaks that make difficult identifying a precise height in the derivative of THTA; or *(iii)* the maxima are difficult to be identified. Therefore, the procedure is not straightforward and presents some limitations. Such kinds of difficulties, however, are also found in lidar studies of the MH (Sicard et al, *Bound.-Lay. Meteorol.* 119, 135-157, 2006).

The identified dust layers are linked to African dust advections, but are also frequently mixed with aged air masses that may be loaded with anthropogenic aerosols.