Atmos. Chem. Phys. Discuss., 9, C2579–C2585, 2009
www.atmos-chem-phys-discuss.net/9/C2579/2009/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Patterns of Saharan dust transport over the Atlantic: winter vs. summer, based on CALIPSO first year data" *by* B. A. Yuval et al.

B. A. Yuval et al.

yuval.ben-ami@weizmann.ac.il

Received and published: 9 July 2009

Authors comment: We would like to thank G. Gangoiti for his beneficial remark. The objective of our paper is to present a description of the average seasonal East-West dust profile over the Atlantic Ocean, based on observations (large dataset of lidar profiles). The goal is to describe the seasonally average distribution of the dust based on all of the dust events we could trace (more than 800 CALIPSO curtains). We are using the clear and unique dust patterns to mark the dust layer top and bottom, in order to describe the dust distribution over the Atlantic. We do not follow air masses, therefore the link to the SAL location is precise as long as the dust serves as a good

marker for it. Once the dust package settles, it may be decoupled from the SAL. It was shown from satellite data (Kaufman et al, J. Geophys. Res., 110, D10S12, 25 doi:10.1029/2003JD004436, 2005) that most of the Saharan dust is deposited in the Atlantic. Here we wanted to follow the dust in higher temporal and spatial resolution and to see if we can describe clear patterns of transport and sinks. As expected we see in our summer analysis that dust plumes are mostly located high above the MBL over the eastern part of the Atlantic. In addition we see another significant transport route lower in the atmosphere closer to the MBL. As we move westward (closer to the Americas) the height of the upper dust plumes significantly decreases (both top and bottom) down to a point where the upper plumes merge with the MBL. Again we would like to emphasize that this is the average position of the dust during the summer season. We do often see dust plume crosses the Atlantic above the marine boundary layer, however, on average the base of the dust plumes sink towards the rising (westward) marine boundary layers' top. Frequently, the upper dust plumes sink and merge with the dust (and marine aerosols) of the MBL. In such cases we could not detect the exact location of dust base. Therefore, as mentioned in the paper, the estimation of the plume base height may suffer from large uncertainty over the western Atlantic. In the attached figures we show an example of a typical dust distribution over the Atlantic summer of 2007. Figure 1 shows a true color MODIS granule of the dust as it crosses the African coastline, hading westward. For the same day the spatial distribution of the dust over the Atlantic Ocean, manifested by high AOD, is shown in figure 2. Figures 3-5 shows CALIOP profiles from the eastern, mid and western Atlantic. On the eastern curtain the plume is detached above the MBL (figure 3). As the dust propagates westward, the sinking is clearly shown (figure 4 and 5). The dust plume merges with the MBL (figure 5).

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 13177, 2009.

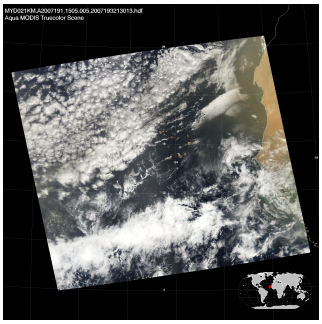

Fig. 1. Dust plume crosses the African coastline, heading westward (Aqua, 10 July 2007)

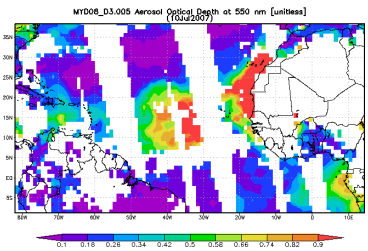

Fig. 2. AOD (550 nm) over the Atlantic Ocean (Aqua, 10 July 2007)

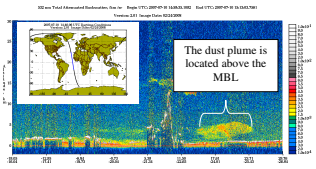

Fig. 3. CALIOP profile over the eastern Atlantic (10 July 2007)

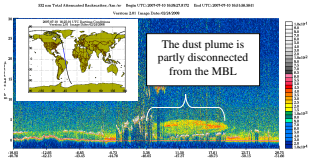

Fig. 4. CALIOP profile over the mid Atlantic (10 July 2007)

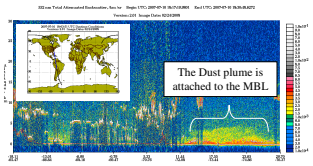

Fig. 5. CALIOP profile over the western Atlantic (10 July 2007)