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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Transport of dust particles from the Bodélé region to the monsoon layer: AMMA case study of the 9–14 June 2006 period" *by* S. Crumeyrolle et al.

Anonymous Referee #1

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The main goal of the paper was to determine the process that facilitates the sedimentation of dust particles from the Saharan Air Layer (SAL) to the boundary layer. To this end, measurements on board the ATR-42 between 10:30 and 13:30 UTC on 13 June 2006 are interpreted using a mesoscale model simulation in order to explain the presence of high dust content over an area where local production is largely restricted by the surface cover. Two mesoscale simulations with the dust radiative impact turned off, have also been done to complement these results, one simulation with dust particle sedimentation (SED) and the other one without dust sedimentation (NOSED).

The paper is clearly written and the authors discuss several experimental and model

results. However, most of paper results are well known and I believe that they do not significantly contribute to the knowledge of the dust transport dynamics. So, the paper cannot be recommended for publication. The authors show the occurrence of the sedimentation of large particles, as it has been generally observed during the transport of dust plumes, but they do not "determine the process that facilitates the sedimentation of dust particles from the Saharan Air Layer (SAL) to the boundary layer". In fact, to support their comments, authors present measurements on board the ATR-42, which have been performed within 3 hours (between 10:30 and 13:30 UTC on 13 June 2006). The African dust transport is driven by complex wind fields and the vertical structure of dust layers which significantly varies in space and time, reflects that complexity, as Fig. 3 reveals. It is generally found "high dust content over an area where local production is largely restricted by the surface cover" and it is well know that high planetary boundary layer heights favor the mixing of aerosol particles. Depolarization lidar measurements performed over different sites have clearly revealed how dust particles affect the aerosol column after injection at high altitudes from ground.

Remarks

1) How the authors define the Saharan Air Layer (SAL) ?

2) Par. 3.1- The simulation begins at 00:00UTC on 8 June 2006. Are model results affected by the simulation start time?

3) Par. 3.2 –How the new dust size spectrum affect model results? Are model results quite sensitive to dust size spectrum?

4) Par. 3.2- page 5059, line 9…Authors say: "As dust particles have a large impact on the radiative budget and thus on the atmospheric dynamics,…………………….. diffusion of dust particles have to be turned off…." Are SED and NOSED simulations meaningful if the dust radiative impact is turned off?

5) Par. 3.3.1- Scales of Fig. 3 are not clear. I suggest the authors to compare time

evolution (from 8 to 14 June) of daily AODs by AERONET with corresponding values by the model to better show the model performance at the three AERONET sites.

6) Par. 3.3.2, pg. 5064, line 11: . . ..."the aerosol particle depth". . .What does it means?

7) Par. 4.1 – I believe that scattering coefficients of Fig. 7a are determined by all aerosol particles. Why the authors only show particle concentrations for particles with Dp>0.5 micron? Is the evolution with the latitude different if the concentration of all particles is considered? Significant changes of particle concentrations with latitude are generally observed during dust outbreaks.

8) Which is the Meso-NH model temporal resolution? For which time intervals model results of Figs. 9-11 have been retrieved?

9) Are model results shown in this paper dependent on the fraction of forest/shrub? (Fig. 8 and Fig. 12).

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 5051, 2010.