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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Vertical profiles, optical and microphysical properties of Saharan dust layers determined by a ship-borne lidar" *by* F. Immler and O. Schrems

Anonymous Referee #1

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General comments

The paper presents an interesting set of measurements and has developed a detailed analysis of two dust events off Africa. Attempting to retrieve aerosol optical properties from lidar measurements might be courageous, but seems to me an interesting piece of work, which deserves publishing in ACP. After clarification of the remarks below.

Specific comments

The statement that the boundary layer contributes more to optical depth than the dust layer is depending on the lidar ratio assumed for the boundary layer. How was the value of 40 chosen? Is there a reference to a lidar ratio for eg sea salt aerosol available? Can

it be excluded, that also some dust was present in the boundary layer? There could have been dust transport in two layers from different origin. At least during event 2 there is a small peak in depolarization. The quality of the Backscatter measurements at low altitudes would also influence the ratio of AOD in the boundary layer versus that at higher altitudes. Could this possibly be commented?

A discussion on the above seems useful, since the authors conclude (page 2724), that in such a multi layer case Şit would be difficult to retrieve meaningful results (from a photometer, which is not vertically resolving)Ť. Even if the computation on AOD in the boundary layer and above would be exact, I think, this sentence requires rewriting. In general photometers give very meaningful vertically integrated results, which are now obtained on a regular basis in a large network (AERONET), hardly ever to achieve with sporadic lidar measurements.

Another far (too far!) reaching conclusion is that ŞLidar measurements can distinguish the origin of dust plumesŤ (p 2724). While it might be correct, that they can distinguish between different aerosol compositions and size distributions, additional info would be needed to backtrack a dust plume to a source.

Also, it is probably not enough to determine Şvertical structure and micro-physical parameters of Saharan dust with ship-borne measurementsŤ to Şdetermine the impact of dust on the global radiation budgetŤ (p 2725). This is not a conclusion from the paper as presented here.

Throughout the text and figures it would be of benefit to specify more exactly the times when data are taken or shown. If a ratio of two profiles is taken (Fig. 2), does a profile comprise a 30 minute average? Are the profiles in figure 4 for all the dust event mentioned in table 1? Table 2 is explicitely stating ha some 4à minute interval was chosen. Which and whe not all the profiles of figure 4?

Figure 2 deserves more explanation. Shown are extinction coefficients, not Şextinctionť as mentioned in the subtitle. To my understanding green and blue colors stand

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for the two channels used? So in fact, four profiles (averaged for which period??) and

I believe Figure 6 should be omitted. It is an average view of the dust plume in June from another piece of work. It is not original and essential to this study. It is well known, that in early summer intensive dust is traveling over the eastern Atlantic. Citation of TOMS images should do it. In addition the picture is not very telling and ŞniceŤ.

Technical corrections

Typos are suggested in upper cases

Header of Table 2 to be corrected ŞThe column ŞMax. RŤ shows the range of variance OF the peak value of the BACKSCATTER ratio during the whole event.Ť However: What does this sentence mean? How can a Şpeak valueŤ vary?

(To study any WHY ANY? differences the <-OMIT EVENTUALLY)1 km mean values were calculated SEPARATELY for the upper and lower part of the plume.

Page 2724, conclusions ŞThis emphasis the valueŤ should read probably Şemphasizes Ť

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 2707, 2003.