

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.

Anonymous Referee #1

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Comments to the paper of Yuval et al., Patterns of Saharan dust transport. . . ., ACPD
General

The paper is based on original material, and focuses on an important topic, the dust and smoke transport over the tropical North Atlantic between Africa and America. The paper is appropriate for ACP.

I have a problem with the comparison itself. Summer and winter transports for different areas are compared (winter apples with summer oranges). So, what do we learn when we compare different transport regimes for different seasons of the year? What is then the message? This is confusing and needs to be improved.

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Please check the JGR 2008 AMMA papers (Pelon et al., Heese et al., Johnson et al., and others), the already referenced Kaufman paper (2005) regarding smoke and transport modes (winter – summer) for the same area, and the recent SAMUM-related 2009 papers (Ansmann et al., GRL, Tesche et al., JGR, Schepanski et al., ACP 2009).

Minor revisions are required.

Details:

Title: ..is to my opinion misleading, because during the winter season the investigated area is mainly from 0 to 10° N, and in this area smoke (50% or more) mixed with dust (50% or less) is observed. During the summer season, the area is from 10-20°N (so different from the winter area, no overlap). In summer only dust is transported from Africa.

Please check the JGR 2008 AMMA papers and the SAMUM papers.

Abstract: ..is misleading. It is not true that the vertical distribution of dust is studied mostly by in situ measurements and models. There have been several activities (SHADE, PRIDE, ACE-2 papers on vertical Saharan dust profiling, recent AMMA and SAMUM activities), there are several lidar networks (Asian Dust Network, EARLINET in Europa) focussing on dust transport, we had the Space Shuttle lidar LITE in 1994. So, it is not true, that CALIPSO is something like the starting point for dust profiling.

Introduction:

Page 13178, line 25, regarding the dust transport to South America. . ., it seems to me that also a lot of smoke is travelling west, to Brazil (see Kaufman 2005, Ansmann 2009).

Page 13179, Line 15. . ., please check the Schepanski paper, ACP 9, 2009.

Page 13179, line 25, dust may extend up to 8 km . . ., I don't believe. Did you find hints for that also when you analyzed the CALIPSO observations?

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Page 13180, line 19, long range transport across the North Atlantic, check Ansmann 2009.

Page 13180, line 25, add recent SAMUM activities regarding multilayer structures.

Page 12180, line 29, Tesche JGR 2009 SAMUM paper focuses on smoke/dust mixtures

Methods

Page 13182, line 22, there is also a lot of dust travelling westward and leaving Africa north of the fire areas at heights below 1.5km, Of course, dust is also transported south and crosses the fire areas before leaving Africa.

Page 13182, line 28, if there is biomass burning than there should be a strong contribution of smoke to the AOD, check the AMMA/DODO and SAMUM papers

Page 13183, line 6: Please provide a clear definition of how you identified the top and base heights of the lofted dust layer ...by eye? by applying a threshold value for the range-corrected signal? Please state!

Results

Page 13186, line 1: Figure 7 only includes low clouds, what's about altocumulus and cirrus layers between 4-15 km height. Please state clearly that you only show low cloud distributions.

References: There are many citations of so-called 'grey' literature: Tanaka 2008, Vaughan et al. 2004, Wendisch et al. 2008, Winker and Pelon 2003. There will be a special issue on CALIPSO in JAOTech and another one in JGR. May be one should contact Winker for more information on that, he is certainly able to provide better CALIPSO-related references.

Page 13193, Figure 2: I am not convinced that the plume south of Central Africa mainly consists of dust, when keeping all the AMMA results in mind. According to MODIS the optical depth of 0.6-1 (red color) is caused by roughly 60% of dust and 40% of smoke,

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in this area with heavy biomass burning plumes? This must be wrong! Please check. How large is the error in the MODIS products?

Page 13194, Figure 3, there are many clouds at heights above 2-3 km height. But they are not included in the cloud statistics in Figure 7, as mentioned.

In the lower plot of Figure 3, the identification of the dust-smoke layer base height seems to be impossible. How did you overcome that problem?

Why not comparing SAME CALIPSO flight tracks (during winter and summer) to better compare summer and winter transport modes over the tropical Atlantic. There is no longitudinal overlap of both color plots. The upper one belongs to a flight track segment north of 8°N (shows the northern hemisphere), the lower one belongs to a track segment south 0° N (shows the southern hemisphere, winter season, has almost nothing to do with the Saharan dust transport). So, nothing can be compared. Just two very different color plots are shown! Must be improved!

Page 13195, Figure 4: Again, both rows are almost not comparable. The upper histograms show the top height distribution in summer for the latitudinal belt from 10-20°N (two modes for the area close to Africa, one is certainly just the MBL top height), the lower histograms show the top heights of the dust-smoke dust layers for the belt from 0 to 10°N. So, what do we compare here, what is the message when comparing different, not overlapping transport regimes? I think the dust is below 1500m height in the belt from 10-20°N in winter. This not presented in the paper at all. But this would be, to my opinion, the most interesting message, see the Schepansky ACP 2009 paper and the sketch in Figure 1 of that paper. Smoke and dust transport in winter and just dust transport in summer is the other important difference (as mentioned in the paper). All in all, the paper does not provide a satisfying picture of the summer/winter differences in the aerosol transport across the Atlantic west of Africa. CALIPSO observed all this!

Page 13196, Figure 5: Here the same could be mentioned what was mentioned above regarding comparisons of results that cannot be compared.

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Another problem. I have my doubts, that CALIPSO permits an accurate determination of the base height (even if the base is separated from the MBL top) because of laser pulse (and backscatter signal) stretching by multiple scattering. So to my opinion, the lower boundaries of the layers in Figure 5 is just speculation. Should be clarified. Furthermore, I do not understand, what the lower figure in Figure 5 shows. How is that compatible to the upper plot (base height)?

Page 13197, Figure 6: dust-smoke layer top height of about 3 km west of Africa (10°N) seems to be too low. Should be close to 4 km. Does CALIPSO clearly detect the top height (weak traces of dust and smoke)? Why is the top height only shown over the Ocean, CALIPSO detects layer top heights over the continents, too.

Page 13198, Figure 7: As mentioned above, altocumulus and cirrus is not included here.

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