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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Transport and vertical structure of aerosols and water vapor over West Africa during the African monsoon dry season" *by* S.-W. Kim et al.

S.-W. Kim et al.

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Reply to Anonymous Referee 1 Comments

We would like to thank the reviewer for his/her detailed and helpful comments. We are fully aware that taking time to provide in-depth reviews is a sacrifice and we greatly appreciate it. Responses to the comments of the referee are embedded below.

The paper uses several measurement platforms (in-situ, remote and satellite) to evaluate the vertical structure of aerosol over the West African Sahel in the dry season. Aerosol in the boundary layer was found to be large and therefore

assumed to be dust, while smaller aerosol in elevated layers was assumed to be smoke aerosol based on back trajectory calculations which led to biomass burning regions. The biomass aerosol layers were also found to have relatively high water vapor mixing ratios. A similar layered structure of the aerosol was found in measurements from both 2006 and 2007 which show the aerosol transport pattern may be typical for the Sahel during the dry season. The mixing of the dust and smoke aerosol over the ocean into a single layer at a somewhat higher altitude in the free troposphere may indicate a fast and long range of transport of these aerosols across the Atlantic. The paper demonstrates using multiple data sets to analyze the aerosol. The use of in-situ, remote and satellite measurements to confer similar results shows how these data sets can be used cooperatively. I would point out that Niger and the entire Sahel is a source region for dust. Unless there were strong winds I would assume that most of the dust measured in the lower atmosphere was local and not necessarily long-range transport from either the Saharan desert or from Mali. The measurements of AOD at various pressure altitudes doesn8217;t add much to the paper as I can8217;t detect any changes in the AOD with altitude. It would be better to show only one plot for each month of the AOD. The wind vector changes with altitude are shown in Figure 2 and so don8217;t need to be shown in Figure 1.

We appreciate for good comments.
In a revised manuscript, we point out that Niger and the entire Sahel is a source region for dust and an importance of strong winds in dust transport from source regions to downwind regions.
On the other hand, aerosol optical depth (AOD) does not show any changes with altitude in Figure 1, because AOD is a quantitative measure of the extinction of solar radiation by the vertically integrated (i.e., column-integrated) aerosol load. Contrary to space-based active sensor (e.g., CALIOP) measurement, space-borne passive sensor (e.g., MISR, MODIS) measurement can provide spatio-temporal distribution of column-

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9, S2098–S2100, 2009

Interactive Comment

integrated AOD, not vertical distribution. We leave only the plot at 850 hPa level, as we mentioned in the reply for reviewer 2, in the revised manuscript.

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Interactive comment on Atmos. Chem. Phys. Discuss., 9, 1831, 2009.

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9, S2098–S2100, 2009

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