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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Vertical profiles of aerosol optical properties over Central Illinois and comparison with surface and satellite measurements" *by* P. J. Sheridan et al.

Anonymous Referee #2

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Vertical profiles of aerosol properties are essential for estimating their climatic effects. There are time series of LIDAR measurements but they do not give all the climatically important information, for instance on the vertical profiles of absorption coefficient or single-scattering albedo. To get these, in situ measurements onboard aircraft are essentially the only way. There are several airborne campaigns conducted around the world but they are not very long. This paper presents a very rare data set: a several year long time series of vertical profiles of aerosol optical properties. The setup of the instruments, the aircraft, the flights, and even technical problems have been presented in a clear and easily readable way. The data have also been compared with satellite-derived aerosol properties which increases the value of this paper further.

I can recommend publishing this paper in ACP. I did not find any errors in it but have some minor suggestions that might increase the value of this paper further:

1) You present the statistics of the vertical profiles as box-whiskers plots which is good. I am just missing and suggesting something that might be of interest to other readers, too: a cumulative statistics of the extensive properties as a function of altitude. What I suggest is that on x-axis you would have for instande 100% * sum(scattering(i)*layer length(i)) where summing goes from surface to altitude i., divided by the total sum. That would tell, how large a fraction of scattering/absorption/extinction (aod) takes place in the layer below altitude i. After calculating these, you could easily make seasonal statistical figures and/or a table. This could be then referenced by others.

2) In page 17206 – 17207 you write: "...The extensive parameters (Fig. 8a–d) show a wavelike pattern, with relatively larger values of these parameters extending to higher altitudes in the summertime. This may be because of the increased height of the top of the mixed layer during the warmer months.." I don't think it would it be a hard work to acquire data on the boundary layer height for instance from soundings or NOAA/ARL meteorological data. Then you could do like in my previous suggestion: using the PBL height information integrate (=sum) your scattering/absorption/extinction*height data and so get a quantitative estimate of how large a fraction of total scattering/absorption/extinction takes place in the PBL.

3) The captions of figures 7, 10, and 11: please write the meanings of the boxes and whiskers in the captions.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 17187, 2012.