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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Aerosol composition and variability in the Baltimore–Washington, DC region" *by* A. J. Beyersdorf et al.

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We thank the reviewer for their comments and suggestions that have improved the manuscript. Responses to their comments are in bold below.

1) Page 23325, line 19. How do these altitude-limited AODs compare with the full-column AOD? The latter, available from DRAGON AERONET sites (Eck et al., 2014 ACP), is more relevant to satellite-based aerosol measurements and their variabilities (e.g., Munchak et al., 2013, AMT).

**A comparison between AOD based on in situ measurements (with vertical profiles extended to ground level) and AERONET AOD is in preparation by**

**co-author Luke Ziemba. Good agreement is seen when AOD is above 0.4. Below 0.4, AERONET is higher than in situ AOD by approximately 0.04. The causes of this will be studied in this future manuscript and may include 1) aerosol above the aircraft, 2) a strong gradient in aerosol at the ground level, 3) the hygroscopic treatment of aerosol, or 4) loss of large aerosol (dust) in the aircraft inlet. The fairly good agreement is discussed in my revised manuscript with a more exhaustive comparison left for Ziemba et al.**

2) Page 23325, line 29. The molar ratio of 1.92 is inconsistent with the numbers in the previous sentence and the inference made in this sentence. If sulfate (96 g/mol) is 23% by mass and if ammonium (18 g/mol) is 10%, the ratio must be (23/96)/(10/18) = 0.43. If sulfate is almost completely neutralized as ammonium sulfate, the ratio must be 0.5 or lower.

**This was a typo and has been changed to a ratio of ammonium-to-sulfate of 1.92 (not the reverse as was originally stated) which is near 2 signifying nearly neutralized ammonium sulfate**

3) Page 23331, line 5. "3 to 4 values" – why is this greater than the number of circuits given in Table 1?

**Table 1 only includes full circuits (where all 6 sites were visited). At the end of some flights, additional spirals were performed over select sites. Thus during a flight there may have been 3 full circuits but 4 spirals could be performed at some of the sites. A sentence discussing this has been added to the Mission Overview and the Diurnal Variability sections and to the Table 1 caption.**

4) Page 23332, line 29. The ambient extinction estimated from the monthly average dry extinction, shown in the right column of Figure 15, varies little. Does the calculation



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use the observed, pre-averaging RH, gamma and SSA? If so, is the result consistent with, for example, the top right panel of Figure 12 where the first two spirals of Flight 14, Site 4 saw similar dry extinctions but different (by 15%) ambient extinctions?

**The ambient extinction for each spiral site in the right column was based on the actual observed pre-averaging RH, gamma and SSA, and the monthly average dry extinction. The reason the percent biases are so large is because the dry extinction varies so much from day-to-day (top of Fig. 15). The right panel of Fig. 12 shows an extreme case where RH is important (causes about 50% of the variability in ambient extinction). In Fig. 16 you can cause biases of up to 50% but this is small in comparison with the 400% due to using monthly average dry extinction.**

5) Page 23333, line 11. Replace the semicolon with a comma.

**done**

6) Page 23333, line 16. Replace “as such” with “as follows”.

**done**

7) Figure 5. Caption. “left” in the last pair of parentheses should read “right”.

**done**

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Interactive comment on Atmos. Chem. Phys. Discuss., 15, 23317, 2015.