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Atmospheric Measurement Techniques Discussions

Interactive comment on "Measurement of non-volatile particle number size distribution" *by* G. I. Gkatzelis et al.

Anonymous Referee #1

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Review of Measurement of non-volatile particle number size distribution by G. I Gkatzelis et al., AMT, 2015

This is a well-written and clear manuscript describing studies of the effects of a thermal denuder on the size distribution and composition aerosol particles generated in the laboratory, produced by oxidation in a smog chamber, and measured in ambient air in a city. The paper is suitable for publication in AMT with only minor revision.

Comments:

1) p. 6357, line 8. Define exactly what is meant by "fine particles" and "PM2.5". PM2.5 is the dry mass of particles collected behind a particle separator with a 50% cut point of 2.5 um aerodynamic diameter.

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2) p. 6358, line 4. Define what a thermodenuder is–a laminar flow tube or tubes with heated walls designed to remove semi-volatile components from particles.

3) p. 6359, line 23. Is the total residence time 15 s, or is that the residence time each in the heater and cooler? What is the temperature at the exit of the cooler, and how is this controlled?

4) p. 6362, line 5. What is the model number of the SMPS?

5) p. 6362 line 23. Is 2% remaining by number or by mass? This is important to always specify since you talk about mass removal as well.

6) p. 6362 line 28. Here and in many places later in the text you talk about "98% particle removal". What you mean is that 98% of the particles had a residue no larger than your minimum detectable size of 10 nm. Although unlikely, there may be smaller cores remaining. Please go through the text and make sure you are precise when talking about the "complete removal" of particles.

7) p. 6363, line 19. Is this NFR or a mass fraction?

8) p. 6364. Remove "furthermore" and change "this technique" to "the TD".

9) p. 6365, lines 2 and 11. Again, you have only shown that particles evaporate to sizes <10 nm.

10) p. 6366 line 5. Define PM1. The AMS does not measure PM1, it measures the mass of non-refractory components with vacuum aerodynamic diameters less than the upper limit of the lens, which can vary from unit to unit. Clearly define the size range of the instrument in VAD and then translate those to physical size for comparison with the SMPS size range.

11) p. 6367 line 3. NFR is already defined.

12) p. 6368, lines 6-10. I was confused by the definition of MFR. You seem to say here that the organic mass was 45% of the remaining particle mass, then you say the MFR

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for organics was 20%. Clearly define MFR as the fraction of the particular constituent remaining after heating in the TD, not as the mass fraction of the total remaining particle mass.

13). p. 6369 line 22. Remove the sentence beginning "All the result. . . ." You've already said this in the experimental description.

14) p. 6370 line 9 and p. 6371 line 11. Why do you think the sulfate might be due to larger particles evaporating? This seems quite conjectural and does not keep attention focused on the more important results.

15) Conclusions. I'd like to see a paragraph discussing the possible implications of the residual organic fraction on studies looking at thermodenuded optical properties and size distributions of residual particles. For example, Lack et al. ("Brown carbon and internal mixing in biomass burning particles", PNAS, 2012) use a thermodenuder to examine the optical properties of coated and "uncoated" BC particles. If these particles are still coated with clear or brown carbon, the results and interpretation could be biased. A listing of the types of studies that might be influenced by your findings would be helpful.

16) Fig. 10. Title should be "PHASE C"

17) Figure 11 is very difficult to make sense of. For Fig. 11a could you please use a box-and-whiskers plot broken into four groups for the four periods of day? For Fig. 11b, could you please plot four categories of data (the four periods of the day) underneath each of the box plots from Fig. 11a? The Y-axis for this plot would be BC mass concentration, and then use a color scale and color each individual point by number fraction remaining? I think this would be much clearer than the current scattered points in 4 hard-to-distinguish colors using symbols of similar (small) size.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 6355, 2015.