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Atmospheric Measurement Techniques Discussions

Interactive comment on "Modification, Calibration, and Performance of the Ultra-High Sensitivity Aerosol Spectrometer for Particle Size Distribution and Volatility Measurements During the Atmospheric Tomography (ATom) Airborne Campaign" *by* Agnieszka Kupc et al.

Anonymous Referee #2

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The manuscript presents a detailed description of modifications to and the subsequent evaluation of two optical particle counters (UHSAS) for use during a multi-year aircraft campaign. It also describes and characterizes a thermal denuder for measuring the non-volatile fraction of aerosol. The subject is appropriate for AMT and the manuscript is well written and clear. I recommend publication once the following minor points have been addressed.

Section 3.1.1, line 10: Recommend changing "This bias" to be more specific, e.g., "The DMA sizing bias". Also, line 14 I believe the authors mean the biases are propagated to the aerosol and volume concentration uncertainties, correct? I assume no adjustment was made to the DMA diameters based on the PSL offset?

Section 3., lines 3-9: The section should also mention that the complex RI of BC will also affect the sizing in addition to LII impacts. I think it is also helpful to the reader to clarify how the incandescence of BC would affect UHSAS sizing (e.g., BC cores heat up and vaporize coatings and affect scattered light signals as the particle moves across the beam, other effects?).

Section 3.3: It appears the detection efficiency was only performed for UHSAS-2? Is there a reason for this? Even if results were similar it would be helpful to report diameters for 50% detection efficiency for both instruments for ammonium sulfate.

Section 4.2, lines 2-4: The particle losses through the TD are only reported down to 150 nm, but the both UHSAS systems measure down to about 70 nm. More information regarding particle losses through the TD should be provided between 70-150 nm. Also, will pressure in the TD affect the losses? I assume this varied over a similar range as described for the UHSAS? I do not think more experiments are needed, but some brief discussion of potential impacts would be useful.

Figure 6: What are the grey, circular "cloud" shapes on each side of the heated section at the top of the figure?

Section 5.3: Are sample flow rates changed during flights? A minor point, but it would be interesting to know if UHSAS response is affected by sample flow rate within a reasonable range. Assuming the residence time in the denuder could be maintained the count rate could be increased in the FT to improve the statistics and reduce uncertainties.

Section 6.1, line 17: I assume the reason to only compare 100-900 nm and not the

full UHSAS size range is to avoid slight variations in detection efficiency and saturation? I am curious how well the instruments compare over the full range given by the manufacturer.

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