

Atmos. Meas. Tech. Discuss., author comment AC1
<https://doi.org/10.5194/amt-2021-21-AC1>, 2021
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Reply to Comments By Anonymous Referee #1

Richard H. Moore et al.

Author comment on "Sizing response of the Ultra-High Sensitivity Aerosol Spectrometer (UHSAS) and Laser Aerosol Spectrometer (LAS) to changes in submicron aerosol composition and refractive index" by Richard H. Moore et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-21-AC1>, 2021

We thank the reviewer for their time and effort on this manuscript and for the positive and constructive comments, which we have now addressed in a revised and improved manuscript. The reviewer's comments are given below along with the authors' response to each in bold text.

Review of "Sizing response of the Ultra-High Sensitivity Aerosol Size Spectrometer (UHSAS) and Laser Aerosol Spectrometer (LAS) to changes in submicron aerosol composition and refractive index" by R.H. Moore, et al.

This manuscript provides experimental results and discussion regarding the sensitivity of size calibrations of two optical particle instruments to aerosol composition and refractive index. Calibration of optical particle counters to particle refractive index is extremely important and can result in significant uncertainties in sizing information if aerosol composition is not accounted for in the instrument calibration and response. This paper is very well organized, presented, and well written. The authors did a careful and detailed job of presenting laboratory experiments as well as examples from field experiments. Their results are important and provide useful context for uncertainties in aerosol size distributions for atmospherically relevant refractive indices. I have very few comments and most of them are minor. I recommend publication after addressing the comments below. Nice job!

Thank you! We appreciate the positive feedback.

Line 145: First figure mentioned should be in order (figure 1).

Done. We have removed the out of order figure references.

Line 169: Include what Figure 1a and 1b are (Figure 1a (LAS) and Figure 1b (UHSAS)).

Done. We added the parenthetical labels as per the reviewer.

Line 174: Same comment as above.

Done. We added the parenthetical labels as per the reviewer.

Line 6: What is considered “dry” for these experiments? Was RH measured?

We did not measure the RH during this experiment, but prior measurements with this sampling setup ($\square 1 \text{ L min}^{-1}$ sample flow through the 1-m silica gel diffusion dryer) indicate that the RH is reduced to less than 20%.

Line 330: How well is RH known, and is it possible that particle bound water is affecting the results?

Based on prior work with this experimental setup, we expect that the sample stream will be dried to less than 20%RH. While we do not expect there to be condensed water that would bias the particle sizing, we speculate here that the refractive index of the salt hydrate may differ from the pure salt; however, we were unable to find literature refractive index values to either support or refute this possibility.

Line 377: Include location of the fire (state).

Done. We added the fire location as per the reviewer and also included a parenthetical link to its page on InciWeb.

Tables: For tables 2-4, include/define RI “refractive index (RI)” in the caption.

Done. We added the requested text as per the reviewer.

Figures:

Figures 1 and 2: Please include wavelengths for the LAS and UHSAS in the captions.

Done. We added the requested text as per the reviewer.

Figure 5: In the caption, please include the RH of the measurements (RH<?).

Done. Now specify that the particles were dried to less than 20%RH.

Figure 8: Please include location of fire (state, US).

Done. We added the fire location as per the reviewer.

Figure 9: Please include location of fire (state, US). Were these data obtained under dry (RH<?) or ambient conditions (please state in caption).

Done. We added the fire location and explicitly note that the size distributions are for dry particles (less than 40%RH) as per the reviewer.

Figures 10-12: Include location of fires and whether the measurements are dry (RH<?) or ambient.

Done. We added the fire location and explicitly note that the size distributions are for dry particles (less than 40%RH) as per the reviewer.

References:

Check formatting, some journals are spelled out in some instances and not in others (e.g., Atmos. Phys. Chem., or Atmospheric Chemistry and Physics).

Done. We have gone through the references to ensure that their style is consistent as per the reviewer.