

Atmos. Meas. Tech. Discuss., referee comment RC2
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Comment on amt-2021-21

Anonymous Referee #2

Referee 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-RC2>, 2021

The authors have provided a well written and structured paper to quantify the sizing errors from two commonly used optical particle sizers, the UHSAS and LAS. The fast sampling rates of these instruments make them a mainstay onboard research aircraft, however sizing errors from aerosol composition and refractive index have not been well quantified. The authors carefully presented the methodology used for the quantification of these errors through a series of lab experiments. In addition, they provided real world examples from measurements made around wildfires. Very little work has been done to quantify the sizing error from these OPSs when measuring biomass aerosol. That makes the results presented in this publication scientifically significant. .

Overarching Comment

What about counting efficiency? Have any corrections for the UHSAS undercounting below 100nm been applied? Looking at Figure 10 upwind leg it appears it hasn't been applied? Is this consistent across the dataset? I was surprised Cai et al. (2008) wasn't mentioned anywhere in the publication. Please improve the UHSAS instrument description section by discussing counting efficiency and if and why corrections were or were not applied

- Line 260, 261,386: Spelling of thermal denuders is not consistent. Line 260 there is a space between thermal and denuder. Lines 261 and 386 there is not a space.
- Line 267: Please quantify what is considered a reasonable level? What was the range of ratios for dilutions used?
- Line 278: The LAS sample flow rate is discussed however no mention of what volumetric flow rate the UHSAS was maintained at
- Line 302: CAMP2EX has a lower case x at the end.
- Lines 375-380: More information about location of this fire, the altitude the

measurements were made at, and average flight speed would help provide better context to the figure and the discussion that follows in 3.2. In addition, some meteorological information would be helpful. Please provide average wind speed and direction for the flight level these measurements were made.

- Line 384: What is the local time?
- Line 440-446: It was briefly mentioned in the instrument description section that LAS has a standard flow rate. Please acknowledge that this was accounted for and what impacts it might have on the FIMS and LAS comparison during FIREX.
- Lines 825-835: Figure 5 and 6 could be better organized and annotated. a and b appear to be zoomed in views of c and d? I feel it would be more logical if the wide view is shown first as a and b and this was discussed in the captions. In addition, these are organized as columns. I recommend labeling the top of the left hand column as LAS and the right hand column as UHSAS instead of repeating it on every image.
- Line 850: Figure 8. Can more information be provided on the location of this fire? Perhaps a map indicating the location of the fire would accomplish this.
- Line 855: Figure 9. Please indicate what Local time is for these measurements