**Atmospheric
Measurement
Techniques
Discussions**

Interactive comment on "Initial investigation of the wavelength dependence of optical properties measured with a new multi-pass aerosol extinction differential optical absorption spectrometer (AE-DOAS)" *by* R. T. Chartier and M. E. Greenslade

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The authors thank Referee #3 for the insightful suggestions and thoughtful comments. The points brought up by the referee are discussed below:

However, the full set of complex refractive indices (CRIs) of PSL spheres over the entire wavelength range have yet to be calculated from the data, and are reserved for some future publication. Only a few bits of this dataset are reported here. This is unfortunate;

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the inclusion of this data would greatly increase the impact of this paper, since many aerosol scientists use PSL spheres for instrument calibration. A more complete dataset than what is already available (370 – 800 nm for PS films) would be useful, especially since this work shows that PSL spheres and PS films have somewhat different CRIs, and since literature CRIs are not available in the UV range at all. Even if the complete CRIs are beyond the scope of this paper, a table or graph to assist readers in comparing literature and measured CRI values at specific wavelengths – the heart of this work – is needed.

The inclusion of a figure to summaries the refractive index values was also suggested by Referee #1 and we have addressed that point by adding a new figure. The new figure presents both the literature refractive index data as well as that retrieved at the two wavelengths used as a case study in this work. We wish to reserve the complete PSL data set for a future publication as this manuscript was meant to show the capabilities of our new instrument and as such is suited for publication in Atmospheric Measurement Techniques. The additional data would create a long and cumbersome manuscript and with such a shift in focus would need to be directed to a different journal. The new figure is included as a supplement to our response to referee #1.

Specific Comments p. 6319 line 18: Here is an example of information that could better be summarized in a table or graph, comparing the various measured and literature CRI values.

See comment above.

p. 6325 line 9: Is only the highest extinction signal used in further calculations of CRI? Or is a time-averaged signal used? What is the significance of the delay between extinction and particle counting? The authors should offer more explanation on how are CRIs are calculated from a time-variant aerosol system.

This is an excellent point. To further explain the details of the particle counting during extinction measurements, we have added several sentences to the experimental sec-

tion: A time offset is defined as the difference between the start time of the AE-DOAS measurement with the highest extinction and the time the maximum concentration was measured by the CPC and is due to particle build up in the volume of the gas cell and the travel time between the gas cell and the CPC. For all PSL measurements discussed in this work, the time offset from the AE-DOAS measurement to the aerosol concentration measurement was between 8.5-10.5 minutes. In a typical 45 minute experiment, the particle concentration rises quickly to a maximum in the first 10 minutes, decreases slightly to a steady state and remains within the CPC error for 25 minutes and decreases within 10 minutes after the atomizer pump is turned off. The steady state particle concentration window is used for the relatively short optical measurements. During specific optical measurement of 120 or 180 seconds integration, an equivalent average was used for particle counting results; in a representative experiment, the standard deviation (1σ) on the particle concentration during the steady state window was 4%.

p. 6237 line 21: Additional experiments are described here but only minimal sample data is shown. Can the authors cite a website or online supplement where the data is made available?

We have supplied some additional data which is compiled in Figure 7 and 8 and we provide such a statement in the paper for clarification. Supplying data beyond this would allow others to complete the RI retrieval we state we are planning for our next paper. Including that information in this paper would change its focus as explained above.

p. 6330 line 6: The statement "there is no wavelength offset needed" is not valid in comparison to the analysis of ozone. An offset of 1 nm (needed to match the ozone data) would not be noticeable on this broad acetone feature.

This is a helpful comment and we have altered our wording to reflect this point. The sentence now reads: The agreement between the literature and experimental spectra

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in Fig. 6 is excellent. No wavelength offset is applied here and none was used for the remainder of the experiments.

p. 6221 line 29: Do the authors mean "k" instead of "CRI" in the sentence "We would have expected the CRI to increase with decreasing wavelength: : :"?

We appreciate the referee catching our mistake here and have appropriately corrected the sentence to read: We would have expected k to increase with decreasing wavelength, but French at al. (2007) observed an interim peak in the imaginary RI near a wavelength of 335 nm (French et al., 2007).

p. 6332 line 23: Spherical vs thin film geometry is mentioned as a possible reason for differing measured CRI values, but Mie theory fully takes sphericity into account.

Yes, the reviewer is correct. We have changed our sentence to focus on the different possible measurement techniques available in each case: Differences could arise because our PSLs are spherical, not thin films that can be subjected to different measurement techniques, and also the PSL samples contain a proprietary surfactant in the solution to reduce agglomeration, which could alter the CRI of the aerosolized PSLs.

p. 6342 Figure 1 caption: the last two sentences are repeated from the experimental section, and therefore can be omitted.

We have deleted these repetitive sentences.

Figures 6 and 7: the open circle symbols are difficult to see.

We have modified our figures as suggested presenting our experimental results as closed symbols. We have also used color on Figure 6 allow the readers to better distinguish between the various symbols.

We have also corrected the typographical errors pointed out by this reviewer.

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