

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

Anonymous Referee #3

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General Comments

This manuscript describes a new aerosol extinction DOAS instrument with a 20 m path length. It is intended to be used primarily in lab experiments on known aerosol samples, but field studies of atmospheric particles are also possible. The spectral subtraction of gas-phase absorbers would be required in both cases. The instrument is unique in that it allows the determination of extinction (and therefore the angstrom exponent) at high resolution over a wide range of wavelengths (220 – 1050 nm) simultaneously. Fur-

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thermore, if the particles are size-selected and counted the complex refractive indices can be determined. In this work the capabilities of the instrument are demonstrated by measurements on polystyrene latex (PSL) spheres, and wavelength calibrations are reported. The paper successfully argues that that aerosol extinction depends notably on complex refractive index (CRI) values, especially in the UV. 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; 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.

Overall, the paper is clearly written, with an introduction full of relevant background information. The conclusions and statements are fully supported by data, with only an occasional exception, noted below.

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.

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.

p. 6237 line 21: Additional experiments are described here but only minimal sample

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data is shown. Can the authors cite a website or online supplement where the data is made available?

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.

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...”?

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.

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

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

Technical Corrections

Typographical errors

p. 6319 line 8

p. 6238 line 17

p. 6333 line 9

p. 6319: “in situ” should not be in parentheses

p. 6325 line 19: “now a division of Thermo Corporation” has already been stated earlier in the manuscript, and can be omitted here.

Interactive comment on Atmos. Meas. Tech. Discuss., 4, 6315, 2011.