

Flores et al., Absorbing aerosol at high relative humidity: closure between hygroscopic growth and optical properties.

In this manuscript, the authors describe a determination of refractive index (RI) from size-resolved extinction measurements and then used these RI with a simple model to study of aerosol optical properties in the vicinity of clouds. The two parts of this manuscript are loosely related and a strong justification for keeping them together in this one manuscript is lacking.

My recommendation is that this manuscript be withdrawn and resubmitted after extensive modification. The experimental part and the modeling part both need to have much more information and justification and comparison with other work. One suggestion is to limit the manuscript to the experimental part and provide the detail that is warranted.

The use of the term 'closure' in title is not accurate.

A closure study uses a measurement or set of measurements as input into a physical model. The results of this model are then compared with a different measurement. For example, size distribution measurements and information on refractive index are used to calculate extinction, which is compared to extinction measurements. This study is an open-ended use of extinction and size measurements to determine refractive index. The authors then assume that the calculated RI is correct, irrespective of its agreement with a-priori RI.

Describe laboratory measurements in abstract.

Pg 1020, "for substances with growth factor less than 1.15 there was, in average, less than 5% difference between the extinction efficiencies calculated using a core-shell model an assuming homogeneous mixing for size parameters less than 2.5." What does this mean?

This paper was very difficult to review. There are many grammatical errors and the paper is not well organized. Figure captions do not match the figures. Figures are included that are not discussed in the text. Frankly, this manuscript should never have made it this far with these types of errors.

Pg 1027 - The description of methodology is inadequate. It is not clear to me how the authors got RI from measurements of size-selected extinction alone. The brief discussion on pg 1030 belongs on page 1027 and needs to be greatly expanded. While much of this material was presented in a previous paper, the methodology of this paper should contain enough information to describe the technique and give the read confidence in the measurements. Iterative calculations, such as used in this paper, are very sensitive to inputs. There is no discussion of uncertainty in extinction or size measurements and how they propagate through to refractive index. My first impression is that the difference between calculated and a priori RI were due to the propagation of inputs and there is nothing in the paper to dissuade me. A discussion of how multiple-charged particles effect the SMPS measurements is

needed.

Data showing the wavelength dependence of the measurements is not presented. Extinction for particles with the composition used should be very different at different wavelengths and should provide another means for determining RI, yet this was not discussed.

The results of the modeling study should be compared with other modeling studies and what measurements have been made. This is a great weakness in this paper. Comments are made on pg 1036 about the significance of aerosol optical properties in the twilight zone because of the scales involved. There is no discussion of scales in this paper to justify that comment. Globally, the twilight zone may or may not have significance, but this paper does not address this issue.

Fig 3, 4, 6 captions do not match figure

Exponential curve should be drawn in Figure 2 and 3 to demonstrate claim.

Figure 5 not discussed in text.

Pg 1020, spell out ammonium sulfate.

Pg 1026, "use d"