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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Comparison of in situ and columnar aerosol spectral measurements during TexAQS-GoMACCS 2006: testing parameterizations for estimating aerosol fine mode properties" *by* D. B. Atkinson et al.

Anonymous Referee #2

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This paper presents a solid technical aspect in spectral extinction measurement. However, the applicability and benefit of using such data to infer fine-mode fraction of extinction is unclear to me. I suggest the authors to resolve the following issues before the paper is published.

This study seeks to decouple the "fine" and "coarse" particle extinction (bep) based on spectral extinction data. The algorithms used were developed for AOD. Since AOD is essentially column-integrated bep, it is not surprising that the algorithms work equally well, if not better, for surface CRD measurements (as vertical inhomogeneity is irrel-

evant), providing that all measurements were quality assured (which I do believe the authors did a good job). However, one knows that R(eff,f) from pure optical methods cannot be exact, since these methods do not address particle size distribution (e.g., number of modes and geometric standard deviation), particle morphology, and refractive index without certain presumptions/constraints. The authors need to make this clear. Although it may be found elsewhere, I suggest some descriptions of underlying assumptions, such as modal size distribution (bi-model, tri-modal?), particle shape, and refractive index, of each spectral method (FMC, GSM, etc.) to be included in the method section. For example, what conditions justify Eq. (3), (6), and (7)? How the equations would change for situations that deviate from the presumptions? Certainly, such situations might not be encountered during this study, but it is important for the readers to evaluate the extrapolation of the conclusions here to other studies. Why R(eff,f) calculation becomes less accurate as eta decreases(p 17481)? Particle absorption is less dependent on size than scattering, and therefore particles of low single scattering albedo may have smaller spectral curvature, which seems to be missed by the GSM method.

In addition, it cannot be very useful if the proposed spectral approach for CRD works only for unimodal size distribution in the fine mode (as it appears to be). Especially the fine-mode fraction of bep can be achieved directly by alternating between non-size-cut and size-cut inlet of a CRD at a single wavelength (e.g., 500 nm). Please explain the benefit of applying the spectral approach to CRD.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 17465, 2009.