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Atmospheric Chemistry and Physics
Discussions

Interactive comment on "Aerosol optical properties in the southeastern United States in summer – Part 1: Hygroscopic growth" *by* C. A. Brock et al.

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The authors thank Dr. Jefferson for the comment on application of the gamma parameterization. Below is the comment, followed by our response.

Comment: The power law gamma approximation of the extinction hygroscopic growth assumes a metastable aerosol in an RH regime of continuous growth. The fit falls apart at low RH values where fRH values are essentially 1.0 over an extended RH range, i.e. the curve flattens out. For aerosol with a high inorganic composition you run the risk of the aerosol efflourescing below 30% RH. Try anchoring the fit at the lower RH value around 30-40% and the gamma fit will work much better. Assume that extinction growth

is negligible from the low RH value of 11% to ~40% RH. Adjust the lower RH value in your fit to 30-40%. The fit will work much better. In future measurements set the RH in the low RH extinction cell to ~30-40%.

Response: This comment is correct for an aerosol that displays phase change behavior, as is common for many remote background and marine aerosols. We now include a plot of the gamma parameterization using RH_0=35% (Fig. 7a), which indeed produces a better fit to the medium and high RH values (and assumes no aerosol water at RH<35%). But this approach is unphysical for a constantly deliquescing aerosol, which we believe is the case for the organic-dominated aerosol in the southeastern US. Additional data presented in the Appendix and Supplemental Materials (for different environments than we measured here) also show a more continuous deliquescence curve for the majority of polluted, presumably organic-dominated cases. And lacking additional information, what value of RH_0 should we choose? This essentially makes the gamma parameterization a two-parameter fit, with gamma and RH_0 as the fitted variables. For our three-point f(RH) measurements we prefer to use a physically based, single-parameter fit (the κext parameterization) that approaches physically reasonable values at the lower limit of atmospheric RH conditions, and that better simulates f(RH) for RH >90%, as shown in the Appendix and Supplemental Materials.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 25695, 2015.