(108-160415-A) **Relationships Amongst Lower Tropospheric and Column-averaged Aerosol Properties and Composition Measured at the Co-located Appalachian State University NOAA and NASA Monitoring Sites - What Do They Tell Us?**

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The southeastern U.S. (SE US), home to large warm-season aerosol loading, is one of only a few regions where surface temperatures did not increase in the 20th century (Trenberth, et al., 2007). One of the high-priority tasks recommended (Kahn et al., 2009) to reduce the uncertainty in aerosol radiative effects is to "*Maintain, enhance, and expand the surface observation networks measuring aerosol optical properties for satellite retrieval validation, model evaluation, and climate change assessments"*. Established in 2009, the high-elevation Appalachian Atmospheric Interdisciplinary Research facility(AppalAIR) at Appalachian State University in Boone, NC (36.21°N, 81.69°W, 1080m) is home to the only co-located NOAA-ESRL, NASA AERONET, and NASA MPLNET aerosol monitoring sites in the SE US and is only one of two such sites in the entire U.S.. Sub-1μm aerosol chemical composition was also measured during summers 2012-2013 and winter 2013 (Link et al., 2015). However, sampling differences introduce significant challenges when trying to integrate the various aerosol datasets. Relationships amongst the aerosol properties can in some cases be used to estimate aerosol properties when only a subset of the measurements are available. In this initial study, we develop simple linear models relating lower tropospheric aerosol optical properties (AOPs), column-averaged AOPs, and aerosol chemical composition measured at AppalAIR over multiple years. We apply the model results to answer the following questions: (1) What information do these simple relationships give us about the aerosols? (2) How well do the lower tropospheric aerosol optical properties track those of the column-averaged aerosols? (3) Can any AOP measurements be used as a proxy for organic and sulfate concentrations and mass fractions and vice versa? The results have implications for sites where only a subset of the aerosol measurements are available, in addition to evaluating chemical transport models and developing satellite-based aerosol classification schemes.

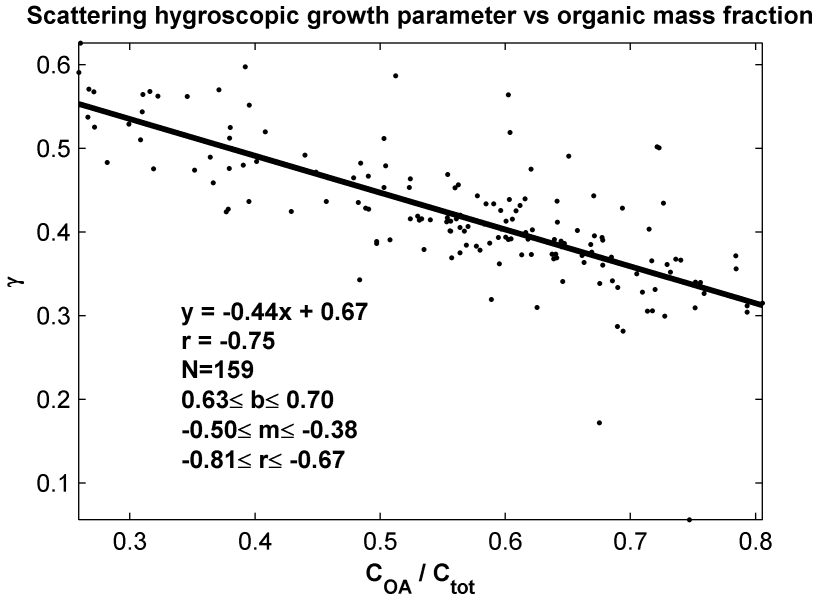

Figure 1. Linear model y=mx+b of daily-averaged sub-1μm aerosol scattering hygroscopic growth factor ϒ versus sub-1μm organic aerosol mass fraction. The ranges of linear model parameters encompass 95% confidence intervals