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Supplement of

Sources, seasonality, and trends of southeast US aerosol: an integrated analysis of surface, aircraft, and satellite observations with the GEOS-Chem chemical transport model

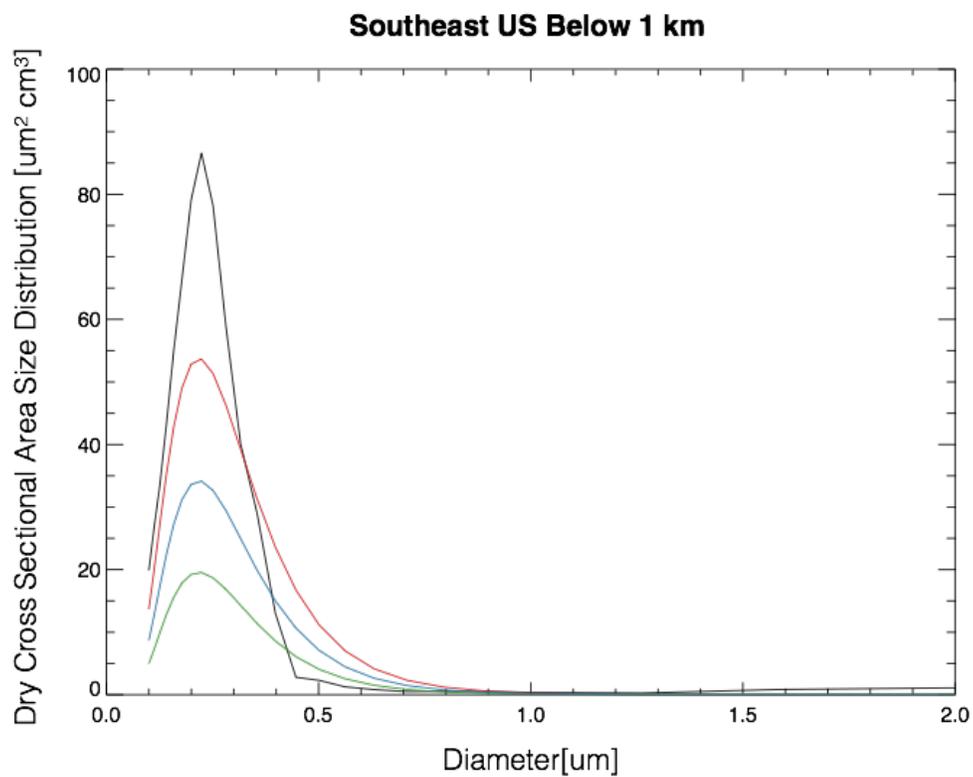
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1 **Supplementary Material**

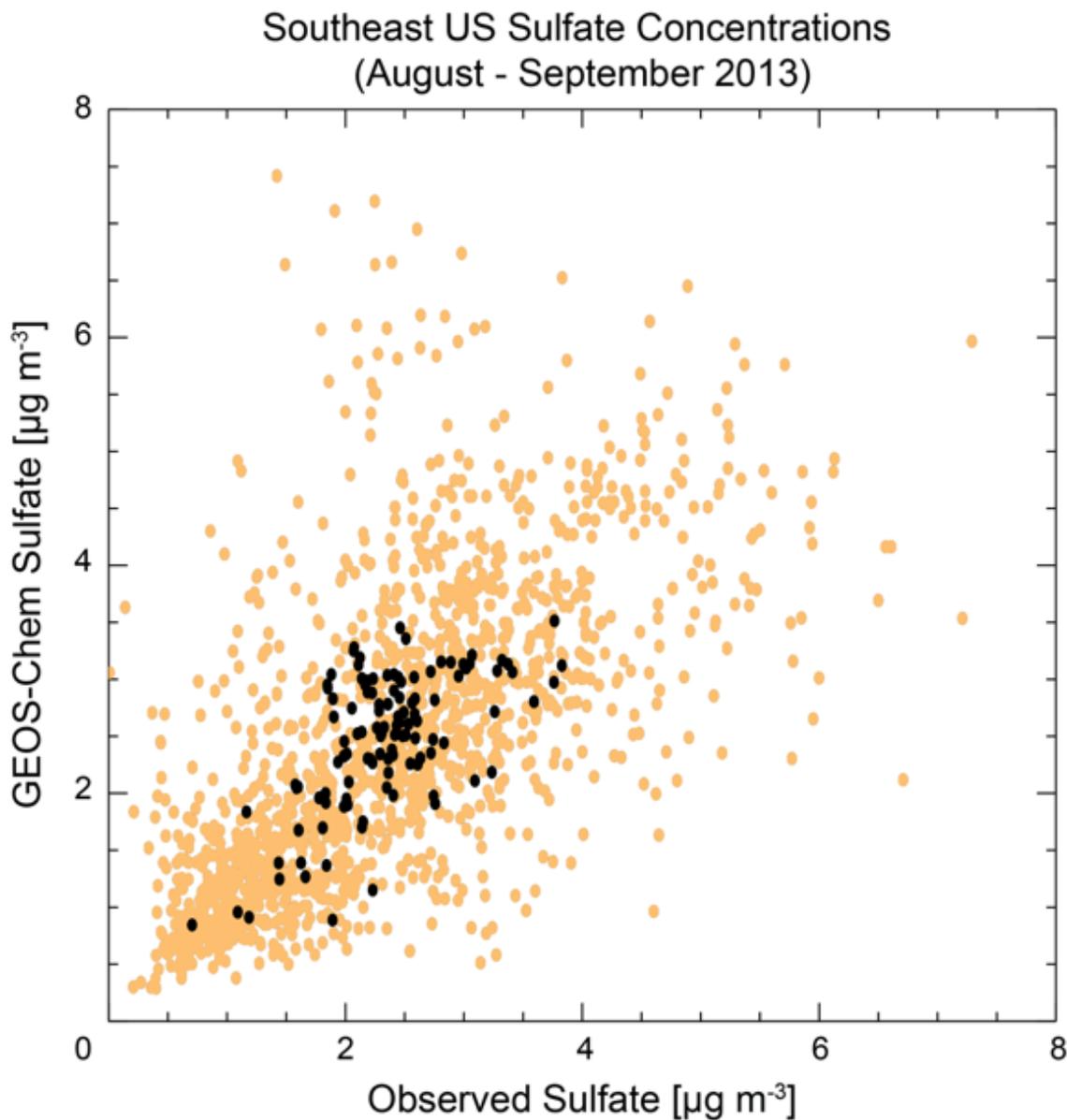
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4 Figure S1: Dry aerosol cross-sectional area size distributions below 1 km over the Southeast US
5 during SEAC⁴RS (August-September 2013). The size distribution from the LAS aboard the DC-8
6 aircraft (black) is compared to GEOS-Chem (red) sampled at the times and locations of the
7 available instrument data. Also shown are the simulated contributions from sulfate and organic
8 carbon (OC).

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12 Figure S2: Scatterplot of daily mean observed and simulated surface sulfate concentrations in the

13 Southeast US during SEAC⁴RS (August-September 2013). The observations are from the CSN,

14 IMPROVE, and SEARCH networks. The comparisons of the mission mean concentration for

15 each individual station is shown in black.

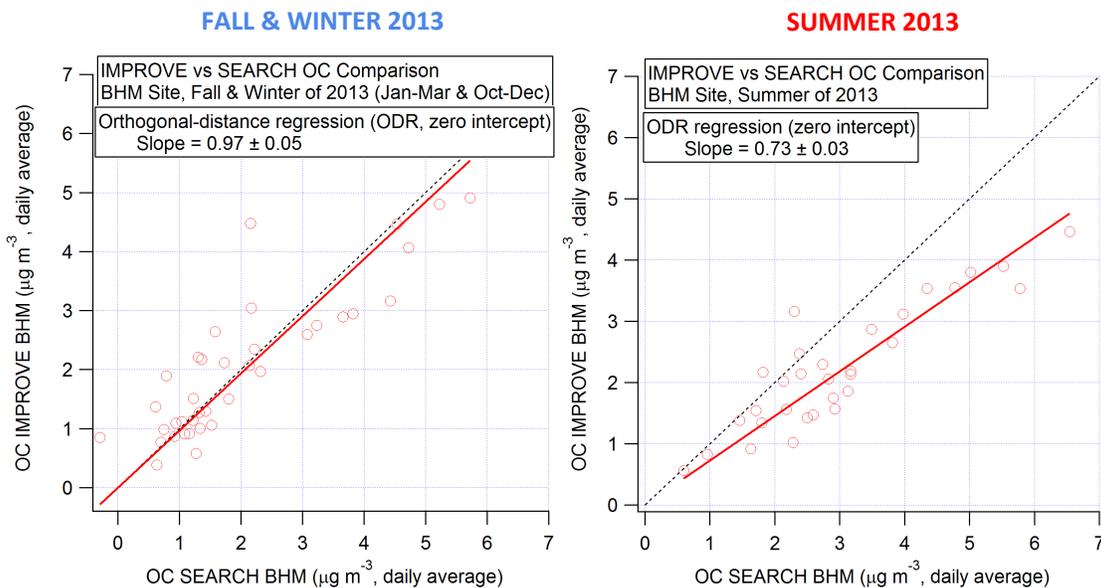
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22 Figure S3: Scatterplot of collocated IMPROVE and SEARCH OC measurements at Birmingham,
 23 Alabama for fall & winter (left) vs. summer (right). The SEARCH measurement uses a gas-phase
 24 denuder and performs automated in-situ analysis within 1 hour of sample collection. IMPROVE
 25 samples stay in the field for a week and are then shipped commercially without cooling. The
 26 differences may be due to evaporation of OC from IMPROVE summer samples after sampling
 27 and shipping, consistent with the prior study of Dillner et al. (2009).

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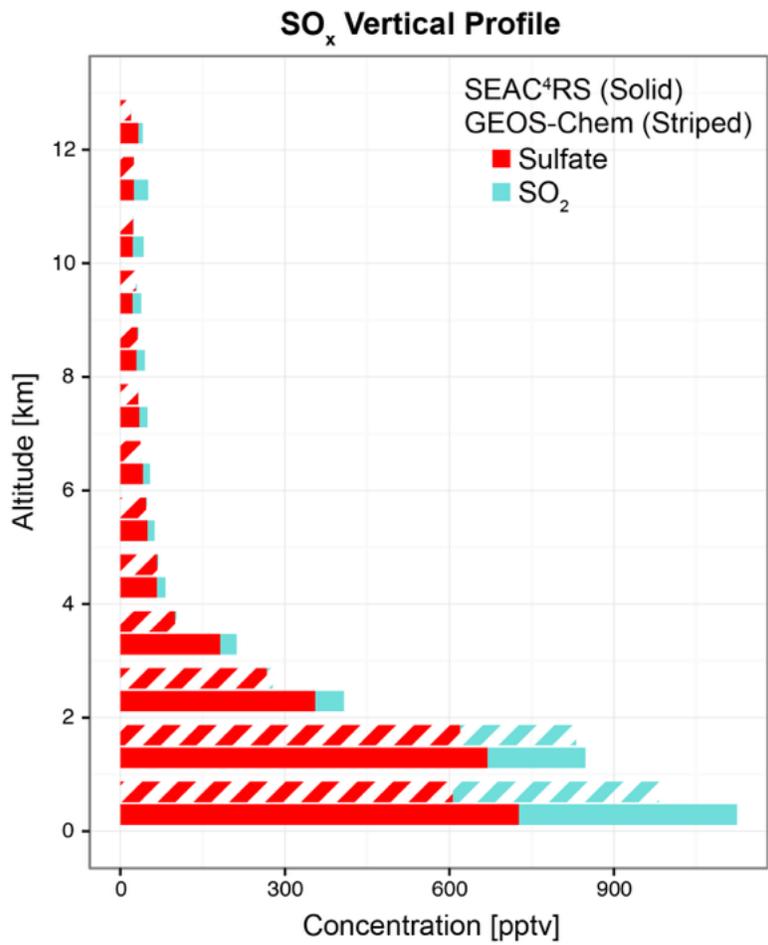
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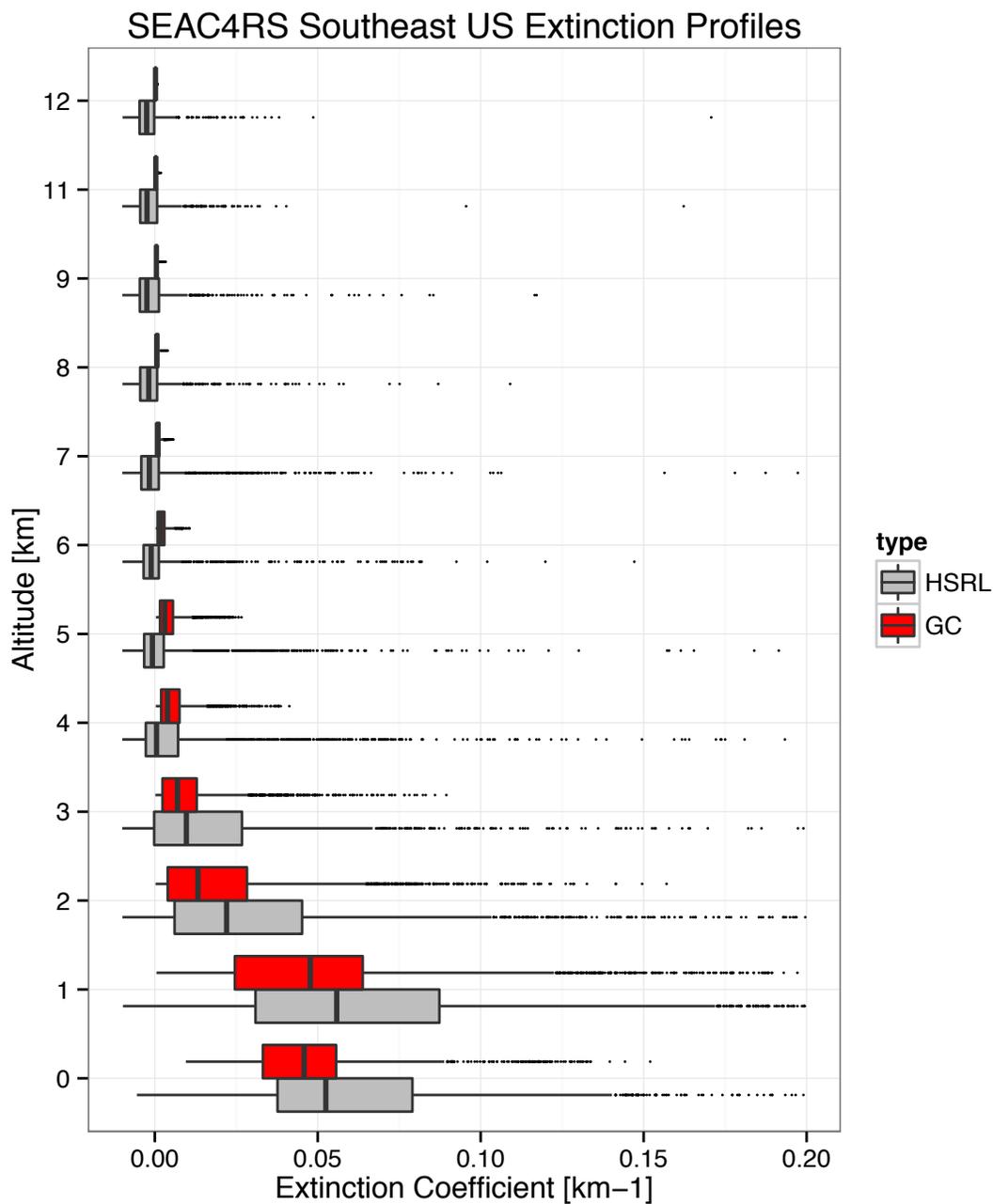
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Figure S4: Median vertical profiles of SO_x (= SO₂ + sulfate) concentrations over the Southeast US during SEAC⁴RS (August-September 2013). Aircraft observations (SO₂ from the Georgia Tech CIMS, sulfate from CU Boulder AMS) are compared to model values in 1-km bins.



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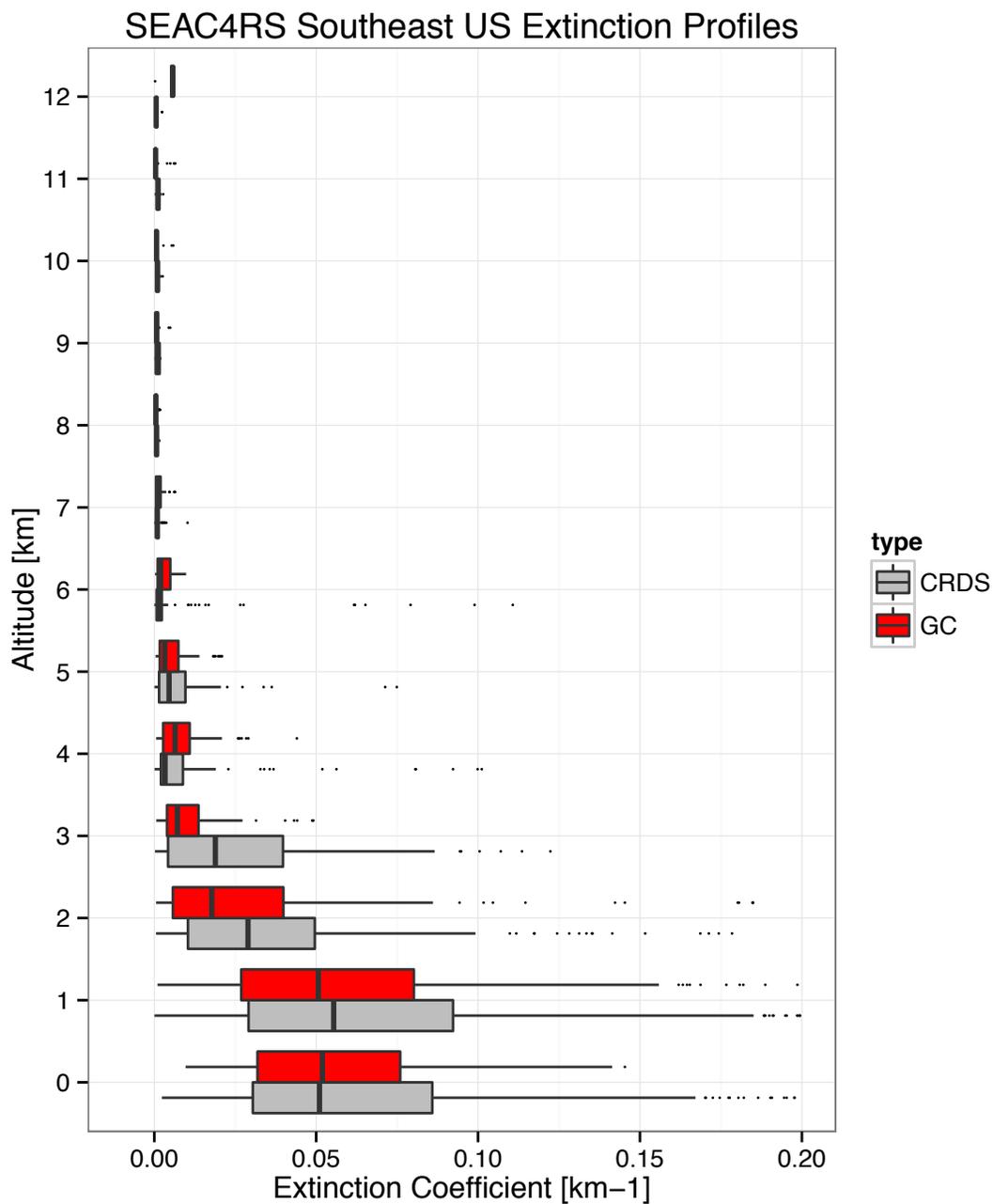
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58 Figure S5: Vertical profile of HSRL and GEOS-Chem aerosol extinction coefficients over the
 59 Southeast US during SEAC⁴RS. GEOS-Chem is sampled at the times and locations of the
 60 available HSRL observations. Boxplots are shown for each 1 km bin.

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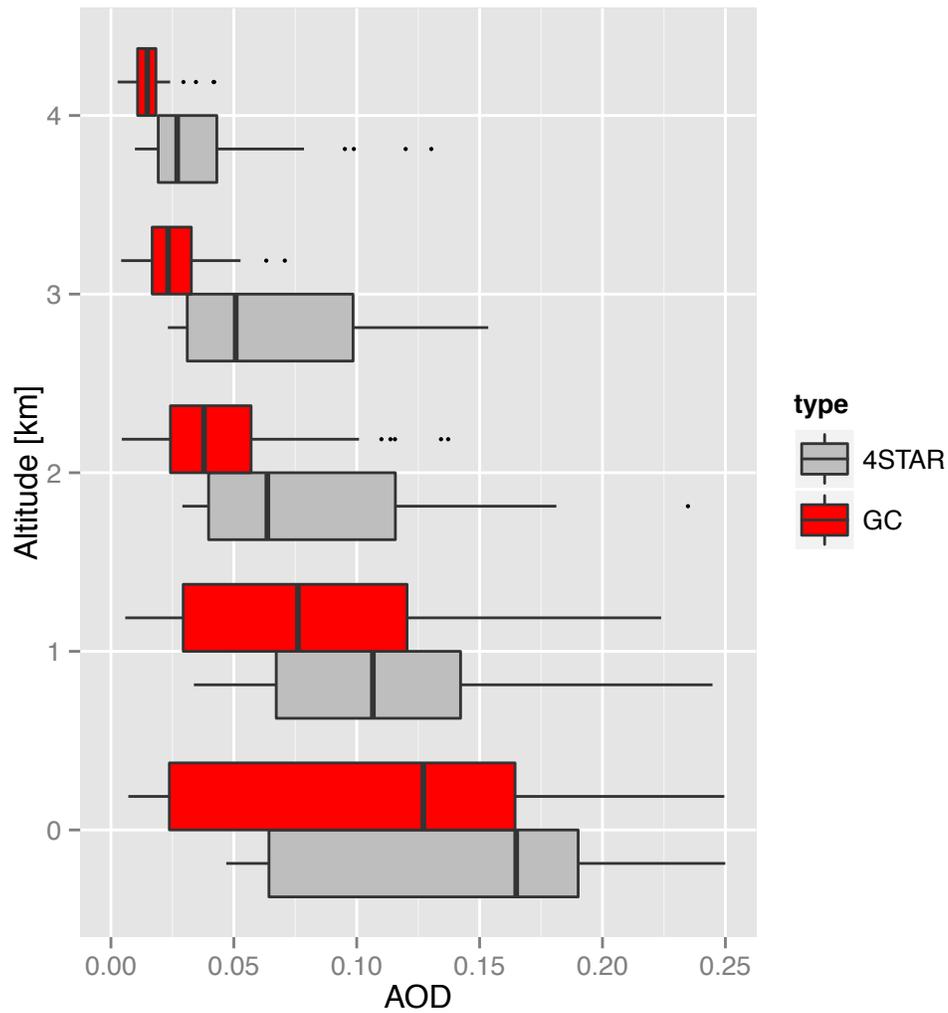
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66 Figure S6: Vertical profile of CRDS and GEOS-Chem aerosol extinction coefficients over the
 67 Southeast US during SEAC⁴RS. GEOS-Chem is sampled at the times and locations of the
 68 available CRDS observations. Boxplots are shown for each 1 km bin.

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74 Figure S7: Vertical profile of above-plane 4STAR and GEOS-Chem AOD at 550 nm over the
75 Southeast US during SEAC⁴RS. GEOS-Chem is sampled at the times and locations of the
76 available high-quality 4STAR observations (quality flag = 0). Boxplots are shown for each 1 km
77 bin.