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Supplement of

Aerosol optical hygroscopicity measurements during the 2010 CARES campaign

D. B. Atkinson et al.

Correspondence to: D. B. Atkinson (atkinsdb@pdx.edu) and C. D. Cappa (cdcappa@ucdavis.edu)

The supplementary online material contains five figures. Figure S1 shows the campaign-average size distribution for supermicron particles ($d_{p,m}$ > ~737nm) measured during the period when the aerodynamic particle sizer (APS) was operating properly. Figure S2 shows an illustration of how the SPLAT II size distributions for individual mixed sulfate/organic (Sulf/Org) particle types are combined to provide an estimate of a single size distribution for which the bulk particle composition is size-dependent. This illustration shows distributions for three different particle types consisting of differing relative amounts of sulfate and organic: Sulf/Org = 0.25/0.75, 0.5/0.5 and 0.75/0.25. The total sulfate distribution is the sum of each of the individual, appropriately weighted particle type distributions, and similarly for the organic distribution. Figure S3 shows the fractional contribution of the supermicron particles ($d_{p,m}$ > 800 nm) to the observed particle extinction or scattering under low RH conditions. It should be noted that the primary analysis of the hygroscopicity data from the T1 site data from after 20 June, while for the T0 site data from 17 June onwards were used. Figure S4 shows a time-series of the relative humidities for the high RH measurements at the T0 and T1 sites along with the measured and calculated f(RH) values. Figure S5 shows a histogram of the κ_{super} values derived at the T0 site when κ_{OOA} was assumed to be time invariant with κ_{OOA} = 0.15.

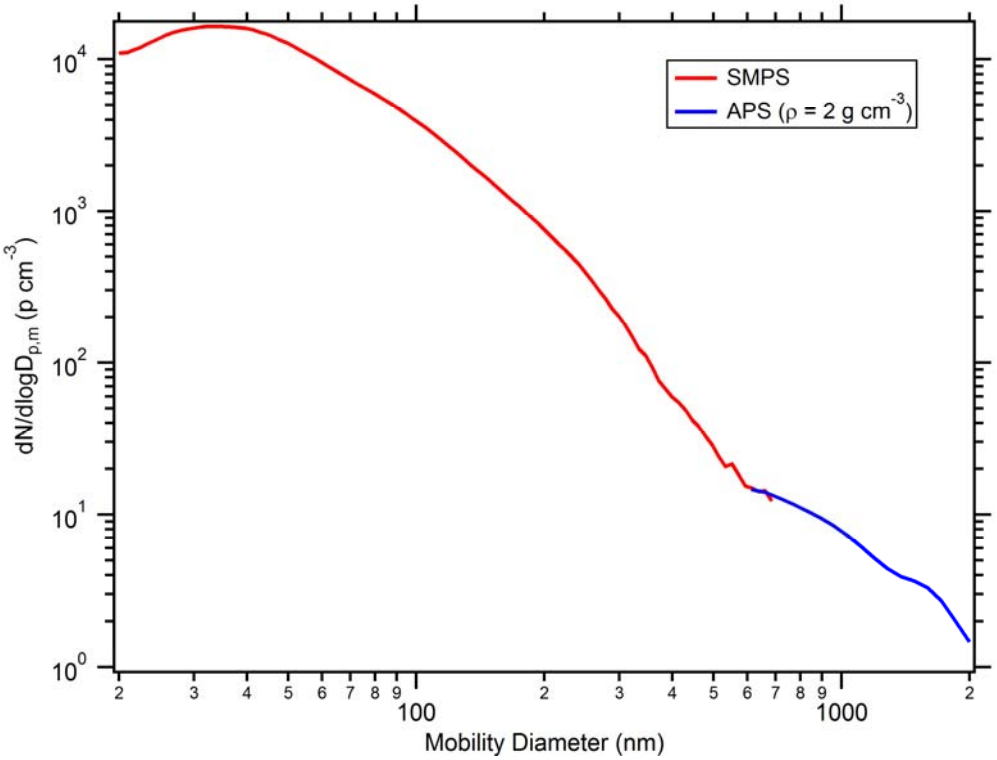

Figure S1. The average supermicron mobility size distribution from the APS at T0 used to estimate the large particle contributions during the "missing" data period is shown in blue, along with the average SMPS distribution determined over the same time period. Note that the f(RH) and γ model calculations are not particularly sensitive to the shape of the assumed supermicron size distribution because the scattering efficiency Q starts to reach an asymptotic limit in the supermicron size range. There is good overlap between the SMPS and APS size distributions.

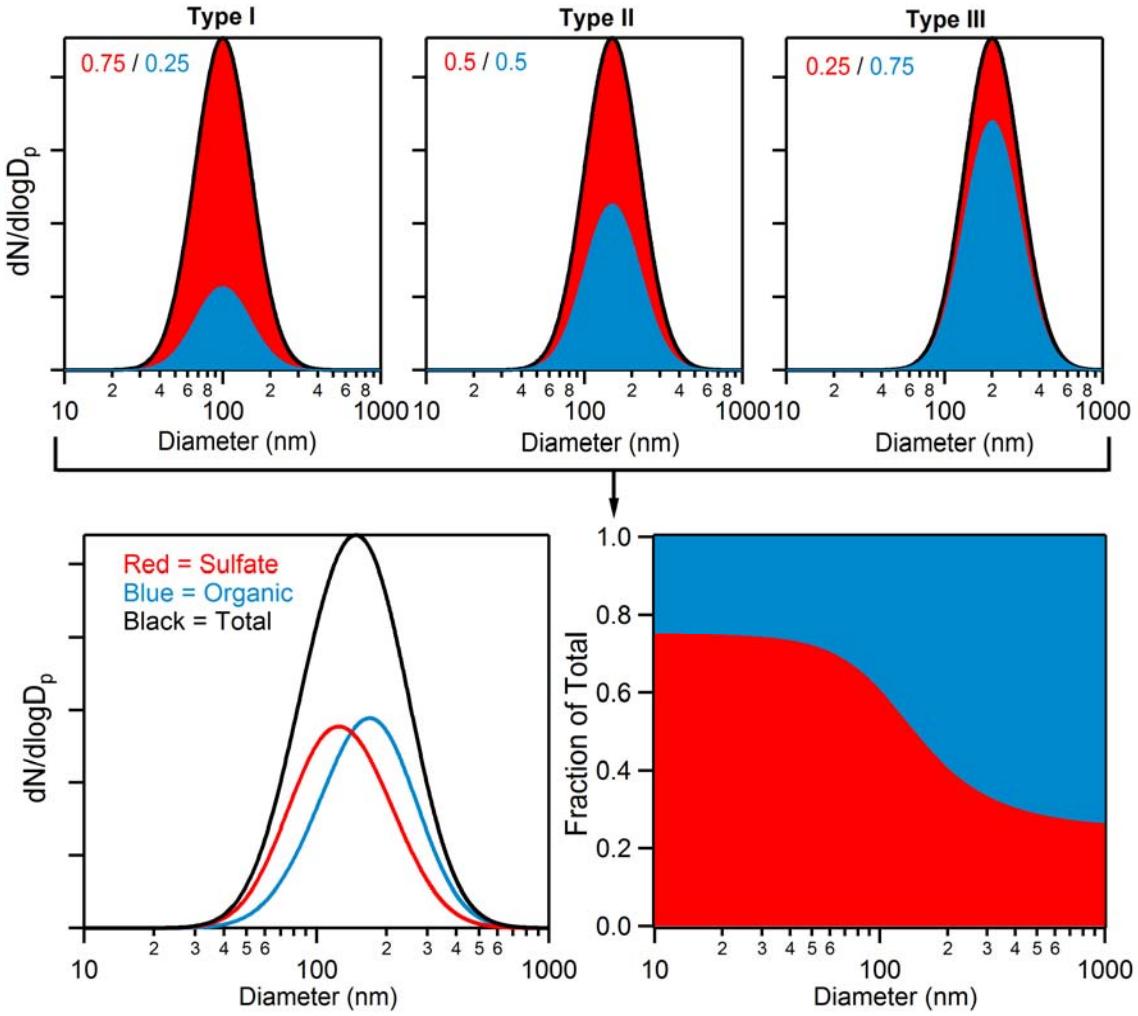

Figure S2. Cartoon illustrating how the individual SPLAT II size distributions for the various Sulf/Org particle types are combined to give an overall distribution with size-dependent composition. The top panels show the distributions for the individual particle types. The bottom panels show (left) the overall sulfate (red) and organic (blue) distributions along with the total (black) distribution, and (right) the resulting relative composition as a function of size.

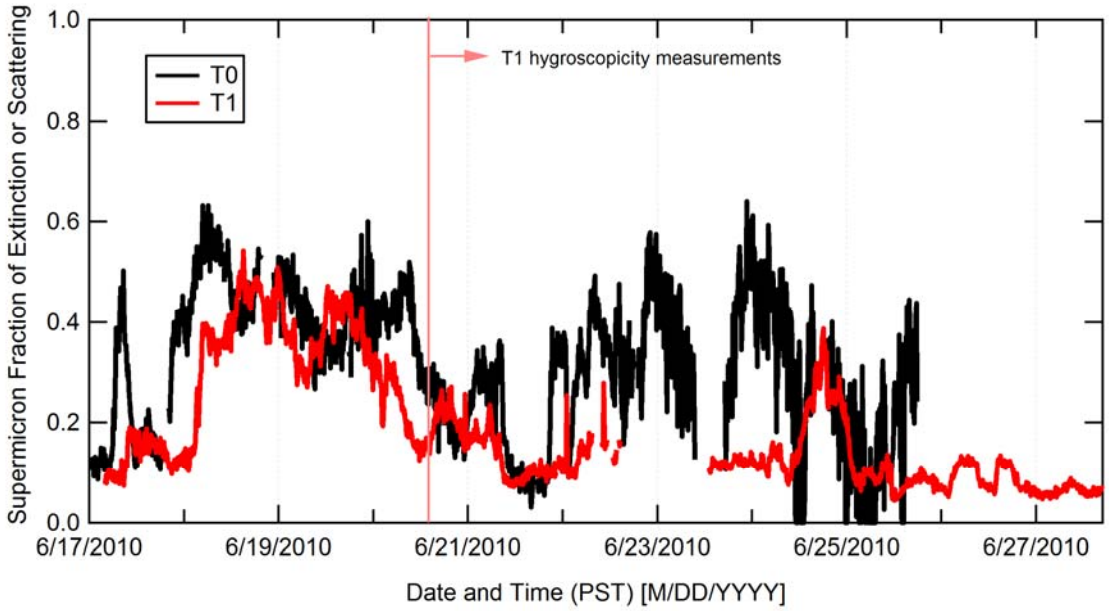

Figure S3. The fraction of the optical coefficients (extinction at T0 and scattering at T1) that is due to the supermicron particles admitted to the two instruments. The period selected for measurement-to-model comparison at site T1 is indicated on the figure.

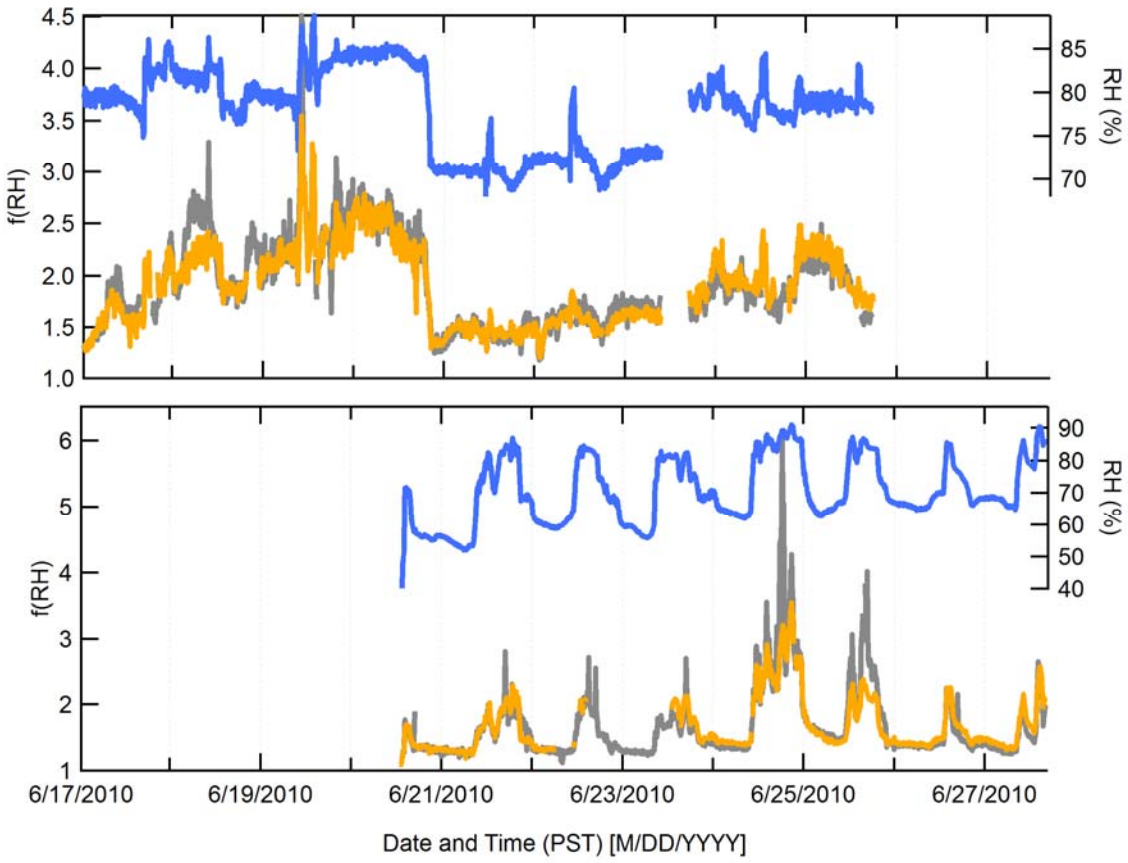

Figure S4 The blue traces are the time series of the high relative humidity data from each site (top panel is T0, bottom T1) and the model (gold) and measurement (grey) *f*(RH) results – the ratio of the high to low RH extinction and scattering coefficients. Note the different scales for the RH axes between the two sites.

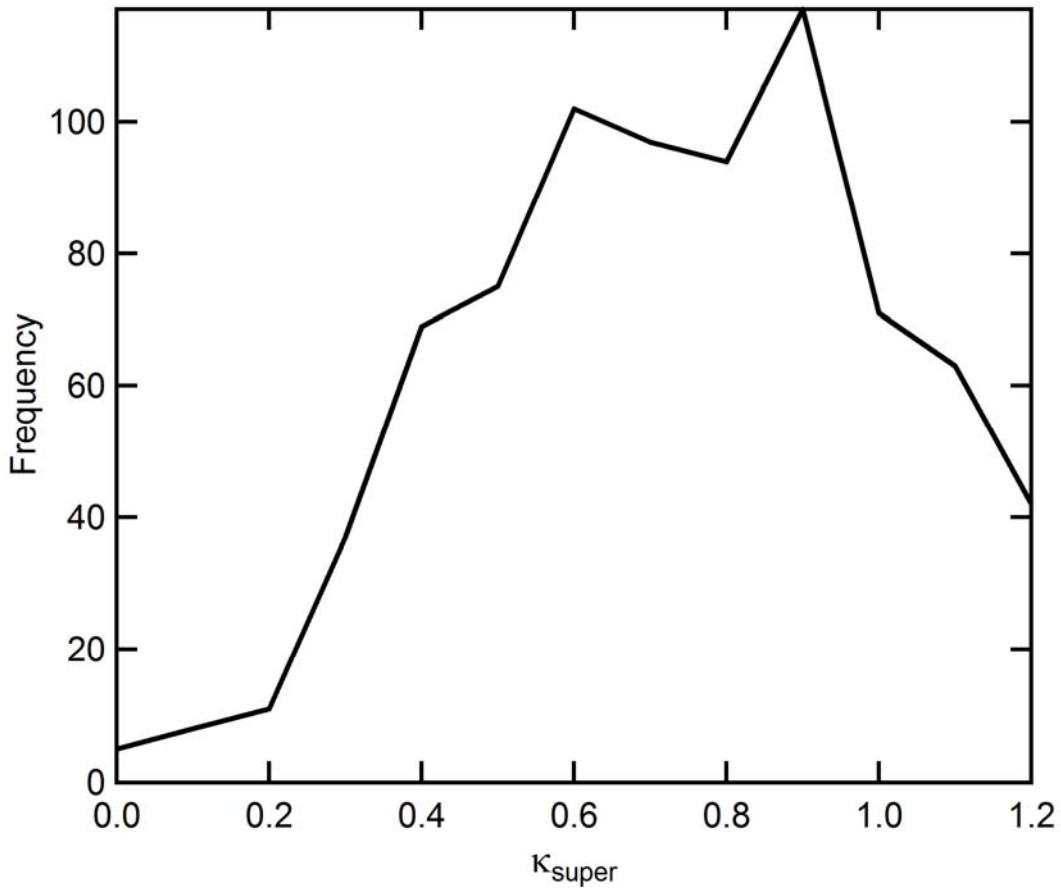

Figure S5. Histogram of derived κ_{super} values at the T0 site when $\kappa_{OOA} = 0.15$.