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Atmospheric Chemistry and Physics Discussions

Interactive comment on "How quickly do cloud droplets form on atmospheric particles?" *by* C. R. Ruehl et al.

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Responses to general comments:

Page 14236, α of pure water and ammonium sulfate aerosol: We have relaxed the assumption that the temperature gradient along the inside wall of the CFSTGC is constant, which changes the α measured for ammonium sulfate particles. α for ammonium sulfate is now calculated to be 0.15. Because the droplet diameter is relatively insensitive to α above 0.1, this means our droplet diameters are very close to what would be predicted if α=1.

Page 14246, the connection between cloud cycling and low-α' CCN: We agree that this interpretation requires not only cloud cycling but also some precipitation, and have added the italicized text to the last sentence: "subject to one or more cloud cycles *with*

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at least some precipitation."

Page 14246, diurnal changes in α', specifically how CCN present in the atmosphere for several days can be low-α': Although we did see lower growth rates around noon than later in the day, we cannot distinguish between three possible causes: (1) diurnal changes in meteorology that might affect, e.g., the ratio of "local" particles and particles transported to the site, (2) oxidation of material already present in the particles, affecting their solubility but not their size, and (3) oxidation of gas-phase precursors that condense onto the particles, increasing their size but not necessarily their solubility. It could be that accumulation mode particles in the atmosphere for a few days have been somewhat oxidized but still grow slowly, and that the addition of soluble material to these particles once near the surface allows them to grow more like AS.

Responses to technical points:

Page 14240, line 12, "the optical divergence of the droplet": We have clarified this point by eliminating the following sentence: "The phase differences between the photodetector signals are determined by the optical divergence of the droplet, which is a function of *D*." We have replaced this with: "The phase differences between the photodetector signals are determined by the curvature of the droplet (a function of *D*), because the divergence of scattered light increases as the droplet curvature increases."

Page 14242, line 9: We have corrected the reference to Eq. 3.

Finally, we have kept the acronyms for field sites, as we feel they make the tables and the figures less cluttered.

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 14233, 2007.

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