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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.

C. R. Ruehl et al.

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Overall remarks:

We have made revisions to each of the interpretations mentioned by the reviewer. Specifically, we have added that cloud cycling *and precipitation* could cause slowly-growing CCN to be prevalent in the free troposphere. More importantly, this interpretation is stated to be a "potential" explanation for our results. Also, we have included another possibility for diurnal cycling at Houston, namely, that "these high-α' CCN might be sea salt particles, which should grow more rapidly than AS particles because there are more ions in a NaCl particle of a given size." Finally, we point out that "much more data would be required, however, to rigorously test this hypothesis."

Specific remarks:

1) Section 2.2 Instrumentation: The fluctuations discussed in this section were not in the CFSTGC flow rate, which was essentially constant, but rather the centerline velocity measured by the PDI. We have added the following italicezed text to emphasize the fact that this is a localized effect: "...possibly due to deviations from a parabolic velocity profile in the SSC *in the vicinity of the view volume*." As stated in the text these fluctuations were primarily seen immediately after changing the temperature gradient, i.e., once the measured temperatures in the instrument were constant for >5 min these fluctuations were negligible.

2) Page 14243, lines 4-7, the size range of ambient particles: These diameters were selected because they are the same as the diameters of ammonium sulfate particles for which α was measured. To clarify, we have added the italicized text: "meaningful values of α_{app} will be derived as long as ambient particles with *D* (at RH = $\sim$80%) from 100 to 250 nm are sampled (*the size range of ammonium sulfate particles used to determine* α)."

3) DMA sheath flow: We have added this sentence to the text: "The DMA sheath flow was taken from the sample stream and filtered; it therefore had a similar T and RH to the DMA sample flow." We has also changed to text to indicate that the DMA RH was at least 80% (not =80%). When ambient RH was <80%, we mixed sample flow with enough filtered, heated, humidified air to achieve RH>80%. In Houston, most times the sample was sent to the DMA without any conditioning. The threshold of 80% was picked because we assume that any ambient particle at that RH would have deliquesced.

4) Additional tables: As suggested, we have added a pair of tables (1a and 1b), which summarize the classification of individual CCN and days, respectively.

5) Section 4 Discussion/conclusions, back trajectories: Although not shown, back trajectories from HOU and SGP on the given days did not show consistent ($\sim$24 hours) descending air masses as seen in BON, and therefore data from these sites could not

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be used to test the hypothesis that low-α' CCN are prevalent in air arriving from aloft.

Technical remarks:

1) We have corrected the legends to Figs. 5-9.

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

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Interactive Comment