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Atmospheric Chemistry and Physics Discussions

Interactive comment on "The effect of organic compounds on the growth rate of clouddroplets in marine and forest settings" *by* N. C. Shantz et al.

N. C. Shantz et al.

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First of all, we would like to thank Referee #3 for the detailed review of our manuscript, with constructive comments and suggestions. Below are our replies to the specific comments provided by the Referee.

Referee comment: -why is used the aerosol scattering cross section for the closure study instead of surface or volume size distribution of ambient particles? The second parameters also include the effect of size, number concentration and chemical composition, but not the refractive index, which is another unknown. If the authors have arguments to support their choice, they have to describe in more details the Mie theory (pg. 9) and the assumptions they use in calculating the scattering cross section, including the values of refractive index used for each specie. Also, they have to discuss why they do not consider the absorption cross section and the effect of black carbon

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on it.

Response: Scattering cross section question: The CCN counter measures scattering from the growing droplets. Because we wanted to model the growth of cloud droplets in the chamber, we determined the scattering cross section in the simulations. We feel this has been presented in the paper, in Sections 1, 2.3 and 3.1.

Mie Theory: More details about the Mie Theory code have been included, as well as the refractive indices for species used in the simulations. Thank-you for the suggestion.

Black carbon: We had black carbon data from the Golden Ears (GE) study and it was included in the GE simulations, as well as its absorption (in the ACPD manuscript, on page 18 lines 7-8 and lines 13-15).

Referee comment: -how are related the physical and chemical measurements of the aerosol properties performed with different time resolutions? In the present form, the aerosol number size distribution seems to be an average over a time interval. In this case, the authors have to report on graphs the measured variations (standard deviations) as a function of size over the period of time. I have the same comment regarding the variation of measured CCN voltage.

Response: Yes, the aerosol properties were averages over the time intervals indicated in Table 3. The 95% confidence levels (2 x standard error = 2 x standard deviation/ sqrt(number of samples)) of the measurements have now been included in either the figures or the captions.

Referee comment: - why any further variation from the empirical adjustment done for a polydisperse sulfate can be attributed only to variations in chemical composition (pg. 11, last paragraph)? why are not used laboratory measurements for the adjustment?

Response: If you are referring to page 13 lines 8-13 in the ACPD manuscript, we did comparisons between laboratory monodisperse aerosol and simulations (not shown). The agreement was good but there were oscillations in the simulations due to the Mie

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code that were suppressed when using a polydisperse ambient aerosol. The ambient measurements showed very little organic on July 27th which is why we used this as our base case. To confirm this was a good assumption, we used July 16th as a case to test it. Thanks for pointing this out.

Referee comment: Given the main goal of this work, I also suggest to the authors to show and to discuss more extensively the simulation which considers the measured soluble (WSOC) and insoluble organic aerosol (pg. 18). The definition of WSOC is still a matter of debate, but it is clear that WSOC behaves different from the insoluble carbon, and therefore, it have to be considered separately when it is available. Besides, I suggest to eliminate the simulation for 17 July 2002 since it does not bring any new information to this study.

Response: We agree, and the simulations for the Golden Ears cases with WSOC were done to consider exactly as the reviewer points out: "that WSOC behaves different from the insoluble carbon". More information has been included with respect to the WSOC in a new section: 4.2.4 Simulations of WSOC from 7 and 11 August 2001, from Golden Ears. Also, see the response to Reviewer #1 third general comment.

We did not look at July 17th data. We used July 27th data to set up the comparison between the model runs and the observations, July 16th was used to test these assumptions and July 18th was a contrasting case with more organic present. We feel that all 3 C-SOLAS cases were important, July 27th and 16th to show the model works for nearly pure sulphate and July 18th for the organics.

Referee minor comment: -pg. 4, line 8: replace "affect" by "effect"

Response: We made a change to page 4 line 5.

Referee minor comment: -pg 9, section 3.2., end of last paragraph: which assumption? Explain better what do you mean with this phrase?

Response: We have changed "this assumption" on page 10 section 3.2 line 12 to "the

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water uptake of organic particles".

Referee minor comment: -pg. 20, 1st par., line 6: is k total or organic? please add the right subscript to k. Same comment for k on pg. 21 last paragraph.

Response: On page 21 line 20, we deleted this kappa. On page 22 line 18, we removed the reference to kappa. On page 22 line 25, both kappa's on this line have been clarified. Thanks.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 8193, 2008.