

Interactive comment on “The effect of varying levels of surfactant on the reactive uptake of N₂O₅ to aqueous aerosol” by V. F. McNeill et al.

V. F. McNeill et al.

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We thank the second reviewer as well for thoughtful comments and appreciate the suggestions for clarification of our work.

Reviewer # 2:

p. 22 line 15 Based on a surface area weighted average particle volume ... Is that V calculated for R at the maximum of the surface size distribution S_{max} ?

***Yes. The wording has been changed to make this more clear. ***

p.22 line 25 log normal size distribution with GSD = 1 is an infinitely sharp spike

***The correction has been made, the typical GSD = 2 for our distributions. ***

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p.23 line 6ff, Fig1b The cut point of the DMA seems more like 400nm, how do you know that the effect is only 30-50% in S.

*** Knowledge of the transmission efficiency of the DMA at large particle sizes is important for the absolute accuracy of our reported g . The reported upper size range of our current DMA is ~ 800 nm in diameter. We have not yet tried to determine the actual cut-point for our system. The observed distributions reported by our GRIMM SMPS system are a convolution of atomizer output, particle losses during transport to and through the kinetics flow tube, and the DMA transmission efficiency (among others). We would not be confident assessing a cut-point to the DMA based on the observed distribution obtained during an experiment.

We estimated the impact of unmeasured surface area in the sizes greater than 800 nm by fitting a log-normal distribution to our measured distributions and extrapolating the distribution to 1 micron diameters. We did this analysis by both constraining the fit to the entire observed distribution, and by constraining the fit to observed particles less than 400 nm in diameter (the latter was in response to this reviewer's suggestion that we may be missing particles above 400 nm). Our analysis suggests that at most we underestimate the surface area by 50%. We feel the 50% estimate is probably a worst-case scenario because larger particles are likely to be lost preferentially both during transit to the flow tube and at the flow tube entrance, so assuming a log normal distribution and ignoring the actual observed distribution beyond 400 nm probably results in an overestimation of the number of large particles in the flow tube.

But, in the end, as we point out in the text (pg 23 Lines 6-9), this issue results in an upper-limit to the measured g and does not affect our overall conclusions regarding the role of surfactants so long as the size distributions for coated and uncoated particles remain similar in terms of mean diameter, etc. ***

p. 29 line 23 the value of the rate coefficient k_5 would be helpful

***The equilibrium constant for reaction 5 is not known at this point. The wording

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has been changed to make this clear, and the description of this calculation has been modified (see our response to reviewer 1). ***

p.28 1st paragraph 1, lines 5 - 18 Regarding the larger σ on NSW aerosol: is it possible, that the data on uncoated NSW aerosol are on error ? In Fig. 4 it looks like that both systems NaCl and NSW are similar within the errors, when coated. Only the non coated NSW and the point with the smallest SDS load fall out of line ! Were the CMD's of these size distribution for these two larger than for the other measurements so that SMPS cut point is more severe?

***The mean diameters (number or surface area weighted) for uncoated particles were not greater than those of the particles containing surfactant (cf. Figure 1). Likewise, the mean diameters for the uncoated NSW aerosol were not greater than those of the uncoated NaCl particles. Thus, we are left to conclude that a difference in aerosol composition is the cause. We note here, and in the text, that our results for reactive uptake with no SDS present are in general agreement with the literature values (cf. p. 28 Lines 9-18). Also, it is interesting that Stewart, et al [Atmos. Chem. Phys., 4, 1381-1388, 2004] observed a similar difference between the g 's for aqueous NaCl and seawater aerosols, although our absolute values are different from those of Stewart, et al. ***

Interactive comment on Atmos. Chem. Phys. Discuss., 6, 17, 2006.

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