

Interactive comment on “Establishing the Impact of Model Surfactants on Cloud Condensation Nuclei Activity of Sea Spray Aerosols” by Sara D. Forestieri et al.

Anonymous Referee #2

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Forestieri present a study of droplet growth and CCN activation for NaCl particles that are coated with surface active, hydrophobic organic acids. The data are fit to a surface film model that accounts for surface tension depression of the drop. Comparisons of surface from the film model to bulk material are made. The main experimental finding of the paper is that surface tension is reduced, but measured critical supersaturations are minimally affected.

This is a timely and excellent paper. To date very few studies have reported equilibrium growth curves all the way to the point of CCN activation. Furthermore, to the paper shows direct comparisons to bulk surface pressure measurements, a link that

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has been difficult to establish. The paper is well written and well referenced. I recommend publication as is.

I would like to add one comment. The calculations in Figure 9 show that the surface film model predicts that pure hydrophobic organic compounds could have an apparent kappa as large as 0.5. The manuscript does make clear that this has not been observed in their data and that this may explain the data of Collins et al. (2016). The authors rightfully point out these authors did not measure composition, making it difficult to perform a direct comparison to theory. Overall, I think the discussion in the manuscript on this point is well balanced.

There have been various claims made about the role of surfactants in droplet activation for some number of years now, with some suggesting that surface tension can cause pure or nearly pure organic compounds to have kappa values that rival those of inorganics, as also suggested by Figure 9. This presents a simple question. Are there any direct measurements (where one is confident about particle composition) that would obey any the three surfactant model lines shown? If the answer is no, how would one guide modelers to constrain the film theory to prevent such unphysical predictions? Or phrased differently, how would the authors review a hypothetical future study that couples the film model with a cloud droplet parameterization, tunes A0, and determines the sensitivity of aerosol indirect effects to the presence of surface active organics?

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