

Interactive comment on “The role of surfactants in Köhler theory reconsidered” by R. Sorjamaa et al.

Anonymous Referee #1

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This paper is focussed on the development of a correct thermodynamic description of the effect of surfactant species on the activation of water solution aerosol particles into water droplets with a focus on mixed salt/surfactant systems. It is highly relevant with the current emphasis in the field on the role of organic species in aerosols. The authors have a good reputation in this area, the techniques that have been applied are appropriate and, for the most part, well described. In particular, the major finding of this treatment, that incorporation of the surfactant in the calculations that include surface/bulk partitioning into the Kohler calculation, has an impact on not only the surface tension, as is to be expected, but also on the number of dissolved species, ie. the Raoult Effect. This is a significant finding. The effects are such that, contrary to the prevailing understanding, the surfactants will not necessarily lead to increased activation but may, in fact, give rise to higher supersaturations.

I recommend publication without significant changes of content. I do recommend, how-

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ever, that the authors should make their paper somewhat more accessible to those who are not in the specific field of CCN/cloud activation studies. As an example, I found myself becoming confused by the use of the term "solute". Does the solute refer collectively to the species that are fully soluble (e.g. NaCl) and the surfactant species (What solubility is assumed for this species?). As a second example, I think that this work could be put into better context by connecting the calculations to what may happen in the atmosphere. For example, a highly relevant question is whether the addition of a surfactant species to a pre-existing salt particle will give rise to increased level of activation, i.e. lower critical supersaturation. After reading this paper, my understanding is still that it will, simply because of the reduced Kelvin Effect (assuming the amount of salt remains the same). However, reading this paper and its conclusions, a casual reader might be confused and think that the addition of the surfactant would actually give rise to decreased activation.

Specific comments:

Page 2784 Line 25: References to the work of Cruz and Pandis have been neglected.

Table 2. What is the other component of the aerosol, besides SDS?

Figure 7. It is not clear what each of the pink lines refer to.

Interactive comment on *Atmos. Chem. Phys. Discuss.*, 4, 2781, 2004.

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