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Interactive comment on "Cloud droplet activation and surface tension of mixtures of slightly soluble organics and inorganic salt" *by* S. Henning et al.

Anonymous Referee #2

Received and published: 3 January 2005

General Comments:

This paper describes measurements of critical supersaturation and surface tension of internally mixed dicarboxylic acid and salt particles in different initial phase states. Measurements are compared to theoretical predictions. These types of measurements are needed, since many particles in the atmosphere are mixtures of organic and inorganic substances. The variety of possible organic species makes it desirable to develop and validate theoretical treatments for their effect on cloud droplet growth. This work seems to be carefully done and produces interesting results that suggest important areas of further research (e.g., effects of particle phase). The writing style is concise, yet still provides useful commentary, for example, when describing consequences of multiple

cusps in the Kohler curves on p. 7467.

Regarding the phase effect, is it possible that kinetic effects in the CCN chamber are responsible for the difference between dry and wet particle behaviour? How much time are particles given to grow in the chamber, and is this enough time for all particles to grow to their critical radius? Particles in a below-cloud environment might have a long time to equilibrate to ambient relative humidity, which would probably be greater than the “dry” initial humidities used here.

Specific Comments:

p. 7465, line 25: Please give an example of highly surface active species for which this effect may be important.

p. 7466, line 11: The several equations following this line seem to be focussed on solubility effects. Suggest adding “, as follows” after “into account” to aid the reader.

p. 7469, line 3: What is the accuracy of the U. Wyoming CCN counter? It is not a single particle counting instrument like the CN counter; is this discrepancy possibly the cause of the non-zero values at the lowest Sc values in Fig. 3 and of the occasional $>$1.0 values at higher Sc?

p. 7470, top section: so the data shown in Fig. 3 already has the DMA transfer function applied?

p. 7471, lines 1 and 2–I think the author is referring to Fig. 4 here; if so this should be clarified. Also regarding Fig. 4, it would be useful to include curves for 100% sa and aa to compare with pure water and the mixtures. Fig. 4 could also be explained more thoroughly–it appears that 100 and 50 nm particles were used for Figs. 4a and 4b and 100, 50, and 40 nm for 4c?

Fig. 6 is a goldmine of information, but was a little confusing at first. The legend should be moved up to pane 6a, and a more detailed introduction to the different data points and theoretical curves shown would be useful in the text.

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Minor Technical Comments:

p. 7465 line 13: “were chosen” should be moved to the end of the sentence so “, which...” immediately follows “acid”

p. 7466 line 19: “droplets” should be “droplet”.

p. 7466, line 18 and elsewhere: commas are missing after introductory phrases (for example, there should be one after “only” in line 18). Also line 8 of p. 7467, etc.

p. 7468, line 18: “series” is missing an s.

p. 7469, line 15: insert “of” after “Downstream”. line 29–is “adequate” supposed to be “equivalent” instead?

p. 7471, line 17: define HULIS

top of p. 7471: Please rewrite first sentence of this section–something is wrong with the grammar.

Interactive comment on Atmos. Chem. Phys. Discuss., 4, 7463, 2004.