

## ***Interactive comment on “A new atmospheric aerosol phase equilibrium model (UHAERO): organic systems” by N. R. Amundson et al.***

### **Anonymous Referee #2**

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The model and results presented here suggest the occurrence of multiple liquid phases in atmospheric aerosol systems containing inorganic and multiple organic components. The results are quite carefully explained but still require some effort to understand. The manuscript is well written. It would benefit from the following points being addressed:

(1) Considerable attention is given to the differences between the alternate versions of UNIFAC, and their effects. However, I suspect that (for systems containing electrolytes) there is a much larger uncertainty associated with the estimation of activities using the CSB approach to combining UNIFAC (organic) and PSC (inorganic) models. The CSB approach as used - I have no disagreement with this - only affects the calculated water activities and not those of other components. It's hard to quantify the effect of this assumption, though I would expect it to be large, and this qualification of the authors'

results needs to be made very clear.

There is a statement in the Conclusion related to the above: the calculations are undoubtedly mathematically rigorous, but the predictions of the thermodynamic properties of the liquid phases - especially those containing electrolytes - remain approximate.

(2) What is the practical effect, on water content and solids formation, if a multi-phase result is assumed only to involve one or two liquid phases? To answer this question, using a couple of the examples from the manuscript, would be perhaps the most useful overall result for aerosol scientists.

(3) Figures 7 to 9 are very complex. It would help greatly if the authors could add some additional information: for example, for points on a section across one or more of the plots, show the content (especially water and organics) in each phase at each selected point. It could be done as pie charts, with each "slice" representing a phase. Make area proportional to amount. I think that without some additional visual information such as this, much of the value of these later figures is lost, and they deserve to be better understood.

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Interactive comment on Atmos. Chem. Phys. Discuss., 7, 8709, 2007.

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