

## ***Interactive comment on “Water activity and activation diameters from hygroscopicity data – Part I: Theory and application to inorganic salts” by S. M. Kreidenweis et al.***

**S. M. Kreidenweis et al.**

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We thank the reviewer for his/her careful reading of the paper and constructive comments. In reply, we summarize the reviewer comments and indicate our proposed action:

*The authors first review the theoretical relationship between solution water activity and particle size as well as approximations that are commonly made in evaluating critical supersaturations for cloud activation. They then discuss ways in which HTDMA data can be used to infer CCN properties. The methodology is then evaluated for HTDMA measurements carried out with sodium chloride and ammonium sulfate. The sensi-*

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*tivity of calculated CCN properties to assumptions of particle and droplet properties (shape, density, surface tension) are discussed, and it is shown that measurements are in very good agreement with expectations based on the best available theoretical methodologies. I think the paper contains original insights, is very well written, and includes a systematic analysis of the problem. Clearly, this is an important paper that will be studied carefully by future HTDMA researchers.*

We thank the reviewer for this supportive remark!

*One limitation of the approach for atmospheric aerosols is that in some locations a significant fraction of the particles consists of chain agglomerates that are slightly hygroscopic. Without supporting information there is no way to know for certain which particles are chain agglomerates. Because shape factors for such particles can greatly exceed 1.0, substantial errors would likely occur if this approach were applied to them. The authors might should comment on this limitation.*

We agree that this is an important limitation. We show in the paper that shape factors modestly different from 1 do not have a large effect, but will change the text to indicate that the error for agglomerates would be quite a bit larger.

*Technical corrections:*

*1. I experienced some difficulty in identifying the relationship between the lines on Figs. 4 and 6 and the key.*

The key is quite small in the online version, but seems readable when downloaded into Acrobat. If others experience similar difficulty, and can suggest a remedy, please let us know and we will modify them.

*2. 7 lines before “5 Parameterization of results”: should be “modest,” not “modestly.”*

Upon re-reading the sentence in question, we believe that “modestly” is correct grammatically.

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