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Atmospheric Chemistry and Physics Discussions



# *Interactive comment on* "Application of osmolality for the determination of water activity and the modelling of cloud formation" *by* G. Kiss and H.-C. Hansson

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In this paper, a potentially very useful strategy for calculating Köhler curves is described. The idea is to calculate water activity from osmolality, a quantity which can be measured e.g. for aerosol samples containing a mixture of unknown chemical species. The paper is suitable for publication in ACP, however, I think that some improvements are needed, mostly for the benefit of readers who are potentially interested in applying the osmalality concept in practice.

1. The osmolality concept is rather vaguely defined on p. 7673. In my opinion, there

should be a theory section in which the following questions are answered: What is the relation of osmolality to osmotic pressure and chemical potential of water? How is Eg. (4) derived? Why is it an approximation? At what concentration range is the approximation expected to fail? Also, please provide better references.

2. What would be the exact procedure to calculate Köhler curves for mixtures representing real atmospheric samples, i.e. aerosol samples or cloud water extracts? Assume that you first weigh the sample to obtain dry mass and then add known quantities of water and measure osmolality and volume of the solution as a fuction of concentration (g solute/kg water). You would then be able to calculate Köhler curves for particles with given dry mass. In order to relate the curves to aerosol size distributions measured with other than impactor methods, you would then have to assume some density, am I correct?

3. How much aerosol mass would be needed to be able to measure osmolality? Wouldn't the amount be so high that you inevitably collect various types of particles and the picture gets distorted?

4. As I understand it, the osmolality concept is useful for cloud modelling because atmospheric particles are complex mixtures, however, all the examples given are for single species. It would be interesting to see a comparison of Köhler curves for electrolyte-organic or organic-organic mixtures calculated using the osmolality approach and the simplified approach. I would be very surprised if no osmolality data (or freezing point depression data from which osmolality can be calculated) is available for any binary mixtures.

As a technical issue, the quality of the figures should be improved.

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Interactive comment on Atmos. Chem. Phys. Discuss., 4, 7667, 2004.