Atmos. Chem. Phys. Discuss., 5, S4411–S4413, 2005
www.atmos-chem-phys.org/acpd/5/S4411/
European Geosciences Union

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Water activity and activation diameters from hygroscopicity data – Part II: Application to organic species" *by* K. A. Koehler et al.

Anonymous Referee #3

Received and published: 12 December 2005

The manuscript applies a procedure to derive water activities from hygroscopic growth measurements for use in CCN activity prediction, that was developed by the same group for inorganic compounds, to water soluble organic compounds. It demonstrates that with respect to model predictions of the fraction of CCN activation the method to leads to comparable uncertainties as direct CCN activation measurements. The method is still sensitive to distinguish and to classify groups of behavior NaCl-like, (NH4)2SO4-like etc. Within the presented framework measurements/modeling the conclusions are clear and sound and the method is surely useful for prediction of CCN behavior in model studies. Moreover, the discussions in the manuscript revealed more

a less explicitly a lack of understanding/data of hygroscopic behavior of semi-volatile organics since the particles obviously change at the time scale of the measurement. It seems that problems with the dicarboxylic acids are partly based on non-conclusive experimental data and that the choice of dicarboxylic acids as model water soluble organic compounds by the atmospheric community was a little unfortunate. I suggest to publish this very good and interesting paper with a few minor changes in ACP.

1. The description of the Tandem DMA system is to short, especially with the respect of the experimental difficulties with volatile and non-drying particles, and dry reference state of the particles.

2. Since it is explicitly discussed later that the attribution of hygroscopic growth to the addition of "pure" water is an approximation, it should be stated also clearly in eq (2)/(3) that the partial molar volume of water in the solution should be taken into account and that the mean molar volume (MW/rho) as given is also an (the same) approximation.

3. I wonder how the corrections applied to malonic acid (Fig. 5) look like for glutaric acid (Fig. 4).

4. Malonic acid HTDMA prediction is not within the uncertainty of the experimental data (p. 10896 and Fig. 10) The manuscript applies a procedure to derive water activities from hygroscopic growth measurements for use in CCN activity prediction, that was developed by the same group for inorganic compounds, to water soluble organic compounds. It demonstrates that with respect to model predictions of the fraction of CCN activation the method to leads to comparable uncertainties as direct CCN activation measurements. The method is still sensitive to distinguish and to classify groups of behavior NaCl-like, (NH4)2SO4-like etc. Within the presented framework measurements/modeling the conclusions are clear and sound and the method is surely useful for prediction of CCN behavior in model studies. Moreover, the discussions in the manuscript revealed more a less explicitly a lack of understanding/data of hygroscopic behavior of semi-volatile organics since the particles obviously change at the time scale

ACPD

5, S4411–S4413, 2005

of the measurement. It seems that problems with the dicarboxylic acids are partly based on non-conclusive experimental data and that the choice of dicarboxylic acids as model water soluble organic compounds by the atmospheric community was a little unfortunate. I suggest to publish this very good and interesting paper with a few minor changes in ACP.

1. The description of the Tandem DMA system is to short, especially with the respect of the experimental difficulties with volatile and non-drying particles, and dry reference state of the particles.

2. Since it is explicitly discussed later that the attribution of hygroscopic growth to the addition of "pure" water is an approximation, it should be stated also clearly in eq (2)/(3) that the partial molar volume of water in the solution should be taken into account and that the mean molar volume (MW/rho) as given is also an (the same) approximation.

3. I wonder how the corrections applied to malonic acid (Fig. 5) look like for glutaric acid (Fig. 4).

4. Malonic acid HTDMA prediction is not within the uncertainty of the experimental data (p. 10896 and Fig. 10)

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 10881, 2005.