

Interactive comment on “Hygroscopic properties of water-soluble matter and humic-like organics in atmospheric fine aerosol” by M. Gysel et al.

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Received and published: 26 November 2003

General comments

The paper by Gysel et al. presents very interesting results from a laboratory study on the hygroscopic behavior of the water soluble organic fraction of air particulate matter sampled at a rural site in Hungary and of fulvic and humic acid reference substances. The experimental data are of high quality and relevance for the interaction of atmospheric particles with water vapor, but the manuscript could be improved by a more precise and consistent terminology, description, and interpretation of the performed model calculations. Some specific suggestions are given below.

Specific comments

1) With respect to the model calculations it is not always apparent which parameters

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exactly have been inserted into which equations. It might be worthwhile to explain this in more detail in the text and/or in the figure captions.

2) The term "average molar volume per solute molecule (or ion)" appears not to be appropriate for the symbol v_s , which depends not only on the properties of the (dry) solute but also on (non-ideal) properties of the aqueous solution, as indicated by the van't Hoff factor in equation (5). Something like "effective molar volume of solute molecules (or ions)" seems to be a more appropriate alternative, and I would suggest to speak of an "effective molar mass M_s " rather than "average molar weight M_s ". For conciseness and clarity I would also suggest to use the terms "hydration" and "dehydration" instead of "increasing RH" and "decreasing RH".

3) It would be desirable to obtain more conclusive messages about the applied models and about the (effective) molecular properties of the investigated substances at the end of section 4.6. Along these lines it might be interesting to compare the measured hygroscopic growth of fulvic and humic reference substances with model calculations using the osmotic coefficient parameterisation for globular macromolecules, which was derived and applied by Mikhailov et al. (Atmos. Chem. Phys. Discuss., 3, 4755–4832, 2003) for particles composed of protein and salts. With regard to the observed restructuring it would also be desirable to obtain more information about the potentially involved processes and effects (electric charging, envelope shape vs. porosity, capillary condensation, etc. as discussed by Mikhailov et al.).

4) Additional measurement data on the hygroscopic growth of the "inorganic+MHOM" fraction of the air particulate matter samples would provide valuable information about the applicability of the Zdanovskii-Stokes-Robinson relation and of the aerosol inorganics model for mixed water soluble material (WSM) particles. Such data would help to progress from a largely empirical to a mechanistic description of the hygroscopic growth of organic particulate matter and mixed WSM particles.

Interactive comment on Atmos. Chem. Phys. Discuss., 3, 4879, 2003.