**Atmospheric
Chemistry
and Physics
Discussions**

Interactive
Comment

Interactive comment on "A comparison of water uptake by aerosols using two thermodynamic models" *by* L. Xu et al.
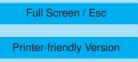
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Dr. Metzger suggested in his reply that we had misunderstood his work and the available literature. This is always possible, but we made every effort to understand: our comment is actually based on a very careful reading of the Xu et al. paper, the Metzger and Lelieveld (2007) paper, and even the Ph. D. thesis (Metzger, 2000, http://igitur-archive.library.uu.nl/dissertations/1930853/inhoud.htm) on which it is based. On the other hand, since Dr. Metzger did not clearly address the substance of our comments, we would like to come back to and be even more explicit about two of our criticisms.

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Interactive Discussion

Discussion Paper

- First, the chemical reaction equation (R1) is wrong. Hydration is a process whereby water molecules, due to their dipolar moment break down (ionize) salt crystals and cluster around each of the resulting ions in several hydration shells oriented according to their polarity and the electric charge of the ion (see e.g. Ken A. Dill and S. Bromberg in *Molecular Driving Forces*, Garland Science, New York, 2003). In the case of NaCl (equation R1) it is this phenomenon that is the dominant one and water ions (always present) do not play any significant role and hence should not be present in (R1). The hydration the author and Wikipedia are talking about and that "leaves the non-water component intact" refers to organic chemistry.

- Second, if the log function is introduced "in analogy" with the pH, doesn't that mean that equation (19) is rather a fit ? Further, the pH is a measure of the activity of H^+ ions and is defined as its decimal co-logarithm *for reasons of numerical convenience* and because of its use (but as a natural logarithm : $\ln = \log_e$) in Nernst's equation. On the contrary, ν_w is a parameter that is supposed to have a physical and/or chemical pre-defined meaning and therefore, if there is a log relationship between it and both ν_e and w_s, this should be proved by some scientific reasoning or demonstration (and there we would rather expect a natural log). So, the call for any "analogy" is of no pertinence here.

In spite of the efforts made by the authors to compare the results, we think that the paper should not be published because EQSAM3 is not a thermodynamical model and is based on too much mistakes, misconceptions and confusions.

R. Lescroart and Jean-Pascal van Ypersele, 21/06/2009