Atmos. Chem. Phys. Discuss., 11, C16515–C16517, 2012
www.atmos-chem-phys-discuss.net/11/C16515/2012/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol hygroscopic growth parameterization based on a solute specific coefficient" *by* S. Metzger et al.

S. Metzger et al.

swen.metzger@mpic.de

Received and published: 20 April 2012

Final reply

We thank the Editor and the Editorial Support of Copernicus Publications for the extensions of the period for "File Upload for Peer-Review Completion".

The revised manuscript now addresses all the issues and comments raised. The didactical structure of the text and equations, including the appendices, has been improved, leading to greater transparency (avoiding misinterpretation and confusion). But all results remained the same, only the overall structure and portions of the text

have been modified such that the key message of this work becomes clearer as requested, i.e., that the ν_i method truly is a single-parameter method.

The modifications include:

1. The title and abstract has been changed to more precisely describe the content of the work.
2. The introduction has been adopted to the new structure.
3. Section 2 has been reorganized and superfluous material removed as requested.
4. The application section 3 has been adopted to the new structure although most of the description is unchanged.
5. The discussion section has been reorganized and superfluous material removed.
6. The conclusions have been changed to more precisely describe the content of the work.
7. The summary of the existing a_w representations is now presented in an appendix.
8. To further remove superfluous material, we have decided to delete our Eq. (17a-d). Instead we just present the underlying key-equation for our a_w parameterization, now Eq. (1). Eq. (1) can be applied in different complexity, i.e., the four equations Eq. (17a-d) are now represented by Table 1. Table 1 has been modified to show the applied cases of Eq. (1), i.e., four different water activity parameterization models (Para1, Para2, Para3 and Para4).
9. The labels of the figures 1-6 have been adopted accordingly. The results remain unchanged, since we previously computed the RH from Eq. (17a-d). Here we

ACPD
11, C16515–C16517, 2012

compute the RH from Eq. (1) with different complexity according to Table 1. We still show the hygroscopic growth factor (HGF), which is plotted in Fig. 1-4 versus the relative humidity (RH). But we now entirely focus throughout this manuscript on the water activity instead of the solute molality, which we prescribe (using data of E-AIM) to compute the a_w and RH with the ν_i method using Eq. (1). The description has been modified accordingly.

10. The solute molality can be obtained from Eq. (1) when the a_w or RH is prescribed. But since this case is not required to demonstrate the applicability of the ν_i method, and since it has obviously led to much confusion, we have removed the equations Eq. (17a-d). Instead we merely address this issue in a new discussion point. It will, however, be further subject of the EQSAM4 description paper (clarified in a follow up of Metzger et al., 2011b).

11. In the appendix we also have added as requested a section on the motivation of the empirical derivation of Eq. (1), including the origin of the A and B terms.

12. We also provided additional plots and explanations to show the functional behavior of the A and B terms, and of the ν_i determination. We now show that the ν_i determination is straightforward as it has an unique solution. Eq. (1) can thus be analytically solved for a_w for the entire a_w-range with only a single constant, even if the A and B terms are used.

13. We have added the missing reference, corrected the cross-referencing and updated the supplement to match the current counting of the applied equations.

Most material we have added in the revised the manuscript comes from our previous replies.

Interactive comment on Atmos. Chem. Phys. Discuss., 11, 24813, 2011.