

Interactive comment on “Comment on Kokkola et al. (2008) – Comparisons with analytical solutions from Khvorostyanov and Curry (2007) on the critical droplet radii and supersaturations of CCN with insoluble fractions” by V. I. Khvorostyanov and J. A. Curry

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The comment on our manuscript is well written and solid in its theoretical basis. The only shortcoming of the comment is that the conclusion is wrong since the error in calculation was not in the false use of plus over minus, a typo in equation (8) in Kokkola et al. (2008a).

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The difference between the two solutions by Khvorostyanov and Curry (2007) and Kokkola et al. (2008a) comes from two different reasons. The first reason for the discrepancy comes from the fact that our results were compared to the results given by equation (30) by Khvorostyanov and Curry (2007) which is the approximation for the small soluble fractions where as the comparison should have been done against equation (27) leading to false conclusion in Kokkola et al. (2008a)

The second reason for the discrepancy comes from the use of r_d which in Khvorostyanov and Curry (2007) is apparently defined as the combined diameter of dry compounds, salt and insoluble. If the insoluble particle fraction is assumed spherical with radius r_u , the Köhler equation should be of form

$$\ln S_w = \frac{A_k}{r} - \frac{B}{r^3 - r_u^3}. \quad (1)$$

The derivation of this equation is given by e.g. (Seinfeld and Pandis, 1998).

In Khvorostyanov and Curry (2007) the Köhler equation is given as

$$\ln S_w = \frac{A_k}{r} - \frac{B}{r^3 - r_d^3} \quad (2)$$

Nevertheless, this difference does not amount to significant differences between the critical supersaturations given by Khvorostyanov and Curry (2007) and Kokkola et al. (2008a). If r_d is replaced by r_u in equation (27) in Khvorostyanov and Curry (2007), the results are identical.

References

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