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Interactive comment on “Reconciliation of measurements of hygroscopic growth and critical supersaturation of aerosol particles in Southwest Germany” by M. Irwin et al.

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Comment on Irwin et al. by Barbara Ervens and Graham Feingold

The authors explore the variability in predicted CCN number concentrations based on the hygroscopicity derived at subsaturated (growth factor, HTDMA) and supersaturated (CCN counter) conditions.

We think that the term ‘potential cloud drop number concentration (CDNC)’ is confusing as it implies that the error in potential CDNC can be applied to estimating effects on cloud drop concentration. We acknowledge that the authors mention this caveat in their analysis by defining ‘potential CDNC’ as the number concentration in equilibrium, i.e.

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if no competition for water vapor exists.

However, since clouds are dynamic systems that are not in equilibrium, the authors' definition of 'potential CDNC' is contradictory. Their conclusions of ~35% error in "potential CDNC" might lead to erroneous assessments of composition effects on realistic cloud properties. We suggest that the authors use cloud condensation (CCN) number concentration, in agreement with all previous studies that have explored similar issues in terms of sensitivities of CCN number concentration to various parameters (e.g., composition, size).

It has been shown in multiple studies that an error of 35% in CCN number concentration translates into much smaller errors in cloud droplet number concentrations; e.g., (Fitzgerald 1974; Ervens et al., 2005; Cubison et al., 2008; Ervens et al., 2010) which might be regarded as negligible considering the much larger uncertainties in other cloud properties.

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