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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A coupled observation – modeling approach for studying activation kinetics from measurements of CCN activity" *by* T. Raatikainen et al.

Anonymous Referee #2

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This paper presents a model describing droplet growth inside DMT CCN counters. In addition to instrument operation parameters including temperature gradient, flow rates, pressure, the model also takes into consideration the effect of water vapor depletion by growing droplets. This effect is more pronounced at high CCN concentrations. The model is validated against measurements using ammonium sulfate calibration aerosols. The authors also apply the model to analyze data collected during ARCTAS 2008 campaign, and show that the change in observed droplet size is mainly due to the depletion of water vapor. Overall the paper is well written, the comparison between model results and calibrations is nice. The topic of the paper is well suited for Atmospheric Chemistry and Physics. I recommend its publication after the authors

consider the comments below.

As one key feature of the model is accounting for the impact of water vapor depletion on grown droplet size, I am a little surprised that this paper hasn't included more direct comparisons to measurements regarding this effect. The four calibrations were carried out at relatively low concentrations at which the depletion effect is very minor. It would be useful to examine the variation of simulated droplet size with increasing CCN concentration (i.e., as the effect of depletion changes from negligible to significant), and compare the simulated variation to measurements.

Page 1834, line 25-28: Ambient aerosol composition has negligible impact on the refractive index of droplets, which is essentially the same as water (1.33).

Eqn. (6) : $ln(S)^2$ should be $(lnS)^2$ or ln^2S.

Page 1840, line 23-25, please also present the comparison between simulated and measured droplet sizes for the ARCTAS calibration.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 1821, 2012.