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Atmospheric Chemistry and Physics Discussions

Interactive comment on "On condensational growth of clusters and nanoparticles in sub-10 nm size range" *by* T. Nieminen et al.

Anonymous Referee #2

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General Comments: This manuscript presents a useful expression for condensational growth rates for sub 10 nanometer particles, improving upon previous formulations by explicitly including physical properties of the condensing vapor (i.e., density, mass, diameter). The manuscript, however, is somewhat lengthy (especially in regards to the derivation of the growth rate expression from equations 1 - 13) and should be shortened before publication.

Specific Comments: 1. Title: The term "cluster" is somewhat misleading as no justification is given to differentiate between cluster and nanoparticle within the text. The measured data that was presented and analyzed gives no indication that the growing "entities" were clusters. 2. Pg. 1694, lines 20 – 22: Growth of atmospheric particles is due to condensation, not "condensational growth", of low volatile vapors. Also, particle

coagulation can contribute significantly to observed particle growth [Stolzenburg et al., 2005] 3. Pg. 1694, line 23: Please include a citation to the work of [Smith et al., 2008] when discussing direct measurement of nanoparticle composition. 4. Page 1695, lines 21 – 24: It is not the initial growth that determines the fraction of nucleated particles reaching CCN size (which is rather far removed from the size of the newly formed particle), but the likely size and time-dependent growth rate integrated from the detection limit to CCN size which gives the particle "lifetime" over which scavenging losses can be calculated, determining the fraction of newly formed particles that survive to CCN size [Kuang et al., 2009]. 5. Page 1696, lines 3 – 4: It should be mentioned that the derivation and subsequent growth rate expression are based on a single component model for the condensing vapor. 6. Page 1702, lines 26 – 30: Please include a citation to the work of [Iida et al., 2008] when discussing observations of sulfuric acid condensation contributing only a fraction to the measured growth rate.

References

Iida, K., et al. (2008), Estimating nanoparticle growth rates from size-dependent charged fractions: analysis of new particle formation events in Mexico City, J. Geophys. Res., 113(D05207), 15, DOI: 10.1029/2007JD009260. Kuang, C., et al. (2009), Determination of cloud condensation nuclei production from measured new particle formation events, Geophys. Res. Lett., 36, L09822, DOI: 10.1029/2009GL037584. Smith, J. N., et al. (2008), Chemical composition of atmospheric nanoparticles formed from nucleation in Tecamac, Mexico: evidence for an important role for organic species in nanoparticle growth, Geophys. Res. Lett., 35(4), L04808, DOI: 10.1029/2007GL032523. Stolzenburg, M. R., et al. (2005), Growth rates of freshly nucleated atmospheric particles in Atlanta, J. Geophys. Res., 110(D22), D22S05, DOI: 10.1029/2005JD005935.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 1693, 2010.