Atmos. Chem. Phys. Discuss., 13, C3273–C3274, 2013
www.atmos-chem-phys-discuss.net/13/C3273/2013/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Influence of aerosol lifetime on the interpretation of nucleation experiments with respect to the first nucleation theorem" *by* S. Ehrhart and J. Curtius

Anonymous Referee #1

Received and published: 7 June 2013

In the manuscript "Influence of aerosol lifetime on the interpretation of nucleation experiments with respect to first nucleation theorem" the authors present the usage of SAWNUC model with three schemata, the neutral, ion-induced and neutral barrier free (kinetically limited) particle formation at one nucleation temperature (248K) and one lifetime (500 s). Their overall conclusions are reasonable, but it is bit disappointing that authors have not even try to compare their simulations to any experimental data available. Since the authors refer through the manuscript to ". . . different laboratory conditions. . . ", one would expect to find such a comparison, e.g. in studies of Berndt et al. (2010) and also Sipila et al. (2010), but there is many more other studies with

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wide variability in experimental conditions, the comparison of particle counters with different cut-off efficiencies is reported in wide range of experimental conditions (RH, residence time), also in Brus et al. (2011) and Kirkby et al. (2011) three different nucleation temperatures are reported. Moreover similar comparison of PARNUC model to experimental data was done in Kirkby et al. (2011), so it should not be a big problem.

Some reasoning or justification why authors have chosen particularly nucleation temperature of 248 K and lifetime 500 s is needed.

What RH was used in simulations?

Wider discussion how will develop n_d vs. n* as a function of nucleation temperature, lifetime, RH, and discussion and recommendations for nucleation lab experiments would be appreciated. Where one would expect greater errors?

Otherwise the manuscript reads well and especially appreciated is its length.

References:

Berndt, T. et al.: Laboratory study on new particle formation from the reaction OH + SO2: influence of experimental conditions, H2O vapour, NH3 and the amine tert-butylamine on the overall process, Atmos. Chem. Phys., 10, 7101-7116, doi:10.5194/acp-10-7101-2010, 2010.

Brus, D. et al.: Homogenous nucleation of sulfuric acid and water at close to atmospherically relevant conditions, Atmos. Chem. Phys., 11, 5277–5287, doi:10.5194/acp-11-5277-2011, 2011.

Kirkby, J et al.: Role of sulphuric acid, ammonia and galactic cosmic rays in atmospheric aerosol nucleation, Nature, 476, 429–433, 2011.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 9733, 2013.