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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric nucleation: highlights of the EUCAARI project and future directions" *by* V.-M. Kerminen et al.

Anonymous Referee #1

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Review of "Atmospheric nucleation: highlights of the EUCAARI project and future directions" by Kerminen et al.

This paper highlights the major technological developments and scientific findings of the aerosol nucleation portion of the EUCAARI project. These include the development of new instruments to measure the number and composition of small ions and particles, evaluation of controlled laboratory experiements and field data to explore the influence of various compounds on nucleation rates, and development of parameterizations for large-scale models.

Nearly all of the developments described in the paper are published or are being published in greater detail in individual papers. However, this paper provides an excellent overview of the developments, and provides a good starting point for them. I recom-

mend this paper to be published in ACP once several comments have been addressed.

1)Page 16500, Line 12: Please also cite “Kazil,ÂăJ., Stier,ÂăP., Zhang,ÂăK., Quaas,ÂăJ., Kinne,ÂăS., O’Donnell,ÂăD., Rast,ÂăS., Esch,ÂăM., Ferrachat,ÂăS., Lohmann,ÂăU., and Feichter,ÂăJ.: Aerosol nucleation and its role for clouds and Earth’s radiative forcing in the aerosol-climate model ECHAM5-HAM, Atmos. Chem. Phys. Discuss., 10, 12261-12308, doi:10.5194/acpd-10-12261-2010, 2010.”, and “Luo, G., and F. Yu, A numerical evaluation of global oceanic emissions of alpha-pinene and isoprene, Atmos. Chem. Phys., 10, 2007-2015, 2010.”

2)Page 16503, Eqn. 1: The coagulation sink is a strong function of size. Why use the coagulation sink of 2 nm particles rather than something in between 2 and 3 nm? The difference in CS between 2 nm and 3 nm is close to a factor of 2.

3)Page 16506, Line 28 through page 16507, line 7: Because ion-induced nucleation cannot be detected when growth rates are slower (please provide a rough cutoff growth rate for when IIN can no longer be detected), won’t this bias this technique towards finding the ion-induced nucleation is less important than it is? IIN can only be found if the growth rates are also fast.

4)Page 16521, line 24: Please cite Yu, F., Ion-mediated nucleation in the atmosphere: Key controlling parameters, implications, and look-up table, J. Geophy. Res., 115, D03206, doi:10.1029/2009JD012630, 2010.

5)Page 16523, top paragraph: How sensitive are the inferred organic condensation rates to the uncertainties in the H2SO4 condensation (either from CIMS or proxy) and the concentrations and growth rates of 2-4 nm particles? Has this sensitivity test been done?

6)Page 16523, lines 9-20: Please quantify the goodness of each parameterization. Give correlation coefficients or a table.

7)Page 16524, line 16: Pierce and Adams 2007 not in references.

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8)Page 16525, line 9: Why not show the Anttila (2010) growth parameterization here instead of or as well as the Lehtinen (2007) one?

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 16497, 2010.