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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Aerosol hygroscopicity and CCN activation kinetics in a boreal forest environment during the 2007 EUCAARI campaign" *by* K. M. Cerully et al.

Anonymous Referee #1

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General Comments

In general, this paper is a mostly well-written, appropriately cited description of a field measurement campaign aimed at understanding aerosol particle hygroscopicity and activation in the Finnish boreal forest. Because of the uncertainties associated with the indirect effect of aerosols on climate, this topic is certainly within the scope of ACP. The manuscript presents new measurement data (the collection techniques for which are appropriate and mostly clear) that are analyzed within the context of pre-existing frameworks (the bases for which are scientifically sound and described adequately). Substantial conclusions are reached based on suitable analysis and interpre-

tation of the data, though these conclusions are not surprising. The title is appropriate, the abstract is sufficient, and mathematical formulae appear correct. Specific comments/corrections are outlined in the following.

Specific Comments

My main criticism of this manuscript is that it does not advance science too significantly given that the techniques to collect and analyze the data are all previously documented and that the conclusions are not very surprising. While the paper is interesting and the techniques appropriate, it appears that this is another point in a global database of hygroscopicity measurements. This in itself is important, but it is not terribly exciting.

Page 15038, line 15. What was the purpose of switching from 90% RH to alternating between 71% and 87% on May 3? Does this not make the data from the two sections of the campaign inconsistent? What was the basis for the selection of 71%, 87%, and 90%? Without justification, it seems random.

Page 15042, lines 19-22. Why were different sizes selected for analysis in the CF-STGC and HTDMA? If the voltage on the (first) DMA is operator specified, why were these measurements not coordinated? While I doubt that comparing 50 nm to 60 nm induces much error, it would have been more appropriate to have the two instruments measuring the hygroscopicity/activation of the same size particles.

Page 15043, line 1. Please clarify how non-hygroscopic particles affect the determination of kappa. If I understand correctly, the GF is determined by comparing the modes of the wetted and dry particles – do the non-hygroscopic particles affect the ability of the hygroscopic particles to uptake water, thereby causing a shift in the mode of the size distribution of the grown particles? This is a little bit outside my area of expertise, so please correct me if I am wrong.

Page 15043, line 17. On Figure 5, it looks as if a significant fraction of the data points lies above the +30% line, while relatively few lie below the -30% line. Is this because

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values for 60 nm are being compared to those for 50 nm? Or are there other reasons that this is the case? What fraction of the data actually lies above the +30% line?

Page 15045, line 3. Would particle growth rate data/particle size distributions help in this discussion of 40 versus 60 versus 80 nm? That is, would it be helpful to know if particles had grown significantly in situ and over what time scale in terms of understanding chemical dispersion?

Section 4.4 seems like a lot of information to get to the punch line at the end that organics do not appear to affect activation kinetics. Perhaps this can be shortened? On line 24, define SMCA.

Figure 1 seems extraneous as no specific analyses corresponding to the dates shown are performed. It seems clear that clean air would not come from the European continent.

The inset on Figure 10c is almost impossible to read.

Typographical Errors

Page 15040, lines 15 and 22. Subject-verb and plural errors. Data were filtered and fit to a spectrum.

Page 15045, lines 18 and 21. Who not whom.

Page 15050, line 17, extra as?

Page 15050, line 26 – a small fraction is and has, not are and have

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Interactive comment on Atmos. Chem. Phys. Discuss., 11, 15029, 2011.