

Interactive comment on “Applying the CPCB setup to study the hygroscopicity and composition of freshly-formed 2–9 nm particles in boreal forest” by I. Riipinen et al.

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Received and published: 22 March 2009

First let me apologize for the very long handling time of the manuscript, which in parts was due to the difficulty finding reviewers.

This reviewer is a generalist rather than a specialist on the particular techniques for the study of freshly-formed 2-9 nm particles. The comments below reflect this.

General comments

The study of the chemical composition of the freshly-formed nano-particles is indirect except that direct comparisons are made with the growth of pure sulphate/ammonium-

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sulphate particles. Organic vapours are inferred to play a role in the growth of the nano-particles under supersaturation, but as far as I can see the arguments in favour of the role of organics are indirect and are not based on chemical analysis. The authors acknowledge that the role of organics is inferred on the basis of indirect evidence rather than a direct analysis by stating for instance in the last sentence of section 3 on p 14 (and in many other places in the manuscript) "Thus some other condensing vapors, presumably organics, are needed to participate in the growth process also in sizes close to 1.3-3 nm." This cautious formulation is not repeated in the conclusions, however, where it is stated that "Our results give indications on the relative role of sulphurous versus organic compounds etc." Similar statements are found also in the other general/summary parts of the paper.

Formation of nano-particles seems to be a transient process which fairly swiftly moves condensing molecules through the nano-particle sizes studied in this paper. As the process is swift (much seems to happen within a (small) fraction of a day) one would think that the exact location of the sampling inlets relative to the land surface and its vegetation, to the surrounding trees and to anthropogenic emission sources in the vicinity, can have a rather strong influence on what is actually observed. One would further think that the nano-particle formation speed could be quite different depending on the height in the surface layer or in the canopy at which the instrument inlets are located. The description of the immediate surroundings of the instrumentation could be helpful; or an argument that it is not so important if that is the case. In fact, in my view Figure 1 would be more helpful if it actually showed a physical sketch of the instrumentation and its location at the site and including where real flows of samples take place, rather than the current diagram. How certain are the authors that inlet lines do not modify the nano-particle spectrum?

The treatment of uncertainty in the observed quantities is largely qualitative and where numbers are given for uncertainty, they are more relevant for specific aspects of the analytical process rather for its totality. It would have been helpful to know more about

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the integrated or accumulated uncertainties in the numbers given eg in Figures 4, 6 and 7. There seems to be a fair change in the detection efficiencies of the individual CPCs during the experiment (Figures 2 and 3), what is the implication of this for the concentrations indicated?

On e.g. pp 12 and 13 it is not easy for a generalist to understand when the text describes processes and mechanisms that modify the nano-particle number concentration inside the instruments, and when the text refers to ambient air. It could also be helpful if the text in the various sections is segmented more clearly into paragraphs that address the same topic, with appropriate sub headings.

Specific comments:

line 6 from below p. 3: "preceding papers"; do the authors mean the papers by Zhang et al and Smith et al and not the paper by Allan et al? Reformulate: "The two first papers.."

line 6 from top of p. 5: "decrease the", is it meant "improve the"?

line 13 from top of p. 5: "this data assess", is it meant "this data to assess"?

line below eq. 1 on p. 9: "nucleated inside" should be "nucleated aerosol inside"?

line 1 top of p. 14: "modelled sulphuric acid concentrations". It would be helpful with an explanatory sentence or two on what this means.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 14893, 2008.

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