Atmos. Chem. Phys. Discuss., 8, S3502–S3506, 2008
www.atmos-chem-phys-discuss.net/8/S3502/2008/

Atmospheric Chemistry and Physics Discussions

Interactive comment on "Mode resolved density of atmospheric aerosol particles" *by* J. Kannosto et al.

Anonymous Referee #1

Received and published: 9 June 2008

The Manuscript presents the application of a method to calculate the density of different particle size fraction by combining mass and number based measurements. The method itself has already been published before, thus the paper is more focused on science than on methods. In general, it is a good idea, because especially the smallest (nucleation mode) particle are difficult to measure or describe in terms of chemical composition and formation processes. Properties such as density may help to learn more about processes and formation.

However, the present quality of the manuscript is not very good. From the scientific point of view no quality assurance is given and the data set is very short. Since the method seems to work automatically it should be easy to apply it to a longer dataset. Also the formal quality of the paper should be very much improved. There are various

errors in orthography, grammar, and punctuation. This should be checked by a native speaker or another suitable person. It was not easy to read as a reviewer and would kindly ask you to check it more careful next time before submission. Also the scientific content is a little bit scarce, the paper should be better motivated in the introduction and much more interpretation is needed. In the current form it is not good enough to be published, it will need major modifications. To me it is not clear what the major result is. The conclusions are just a summary and nothing is concluded there. Another small point is that the bandwidth of references is a bit narrow. Concerning new particle formation mainly the finish studies are cited, but there are others available which might be compared to the boreal forest data or at least mentioned somewhere.

Comments in detail Introduction: This section does not give an overview over state of the art. It is not clear if the authors want to give this overview or if they want to limit it to the boreal forest. But there are a few urban studies without any hint that there might be a difference. I think new particle formation next to a road could be something completely different from the boreal forest or other sites. New particle formation has been measured at very different locations, something about these differences should be mentioned and maybe some more references could be given.

Method description: How many modes are usually fitted and why? Was the method evaluated in terms of different concentration levels? To my knowledge the ELPI is getting more inaccurate at lower concentrations. Did you do any comparison before at different concentrations? Is it possible that the quality of the method varies with the level of pollution?

Method evaluation: First paragraph: What does "carefully calibrated impactor" mean? What was done and what was the result? Are talking about ELPI here? There is always written impactor now or was there another one? I dont see that Figure 1 shows the calibration is essential; More details about the calibration are needed, what was done and what was the result. This should be shown for different concentrations! You are talking about two types of errors which happen and such values were removed.

ACPD

8, S3502–S3506, 2008

Interactive Comment

How often does it happen? How many data have been removed in total and how many are left? I would like to see the method applied to much more data. Description of the measurement campaign: Did you do any corrections concerning particle losses? Why two sites with different instruments, why not using two from the same place? Whats about turbulence in the inlet lines? 8 mm sound to me like a turbulent flow, can you estimate that? You have nearly double instrumentation, perfect for comparison, did you do that? I dont really understand why you chose two instruments from different containers. The measurement campaign should be divided into different periods, maybe with regard to wind direction or particle concentration or new particle formation. This makes everything easier and will also point out the results more clearly. From Figure 4 one can clearly identify different periods with different behavior, at least 2 or 3 different periods should be introduced here.

Results: density of nucleation mode particles varies between 0.5 and 1.5 This is a lot, what does it mean? Maybe mean values for different period can help to find the reason for that. I do not see a clear difference between density of Aitken and nucleation mode. Why? Or maybe change the plots to make it clear. What is new in this paper compared to Saarikoski et al.(2006)? The results for densities are not well discussed here. This should be improved to find something really new. The large variety for Aitken and accumulation mode is given but not explained or discussed. Here again the separation into different periods may help to calculate mean values for different situations. Changes in the densities are observed but not explained or interpreted. This is not sufficient for a scientific publication. Last paragraph of result-section: it is an interesting result that the density changes during growth process? Was this observed for other days? This feature should be analyzed in more detail! The best would be to use more data for this investigation. What is the conclusion from this development? Does it fit with other studies focused on the growth process? You should really speculate about this result, because this was the idea of the study.

Conclusion: this is just a summary and should be filled with real conclusions, why does

ACPD

8, S3502–S3506, 2008

the density change under these conditions and so on. There is a lot of material to speculate, the authors should do that. E.g., why do Aitken particle change their density during nucleation and so on! I think there are some theories available and they should be proved here!

Formal Abstract: line 10: "..density can be investigated in the time scale..", here "the" should be added

"This allows us to follow..", in the ms there is a "the" instead of to

Page 2, line 2 "e,g," should be "e.g." this occurs several times in the following

In general: number/space/unit, in the ms it always mixed sometimes there is a space, sometimes not.

Page 2, second paragraph, line 1: why here 0.1 micrometer, 100 nm would be better and later there is always nm used.

Page 3, second paragraph, line 6: add "s" to the word "event"

Page 3, second paragraph, line 8: the first "of" should be "for"

Page 6, line 6: "the other" should be replaced by "one"

Page 7, second paragraph, line 1: "particles": here the "s" should be removed

Page 7, second paragraph, line 6+7: What does "ab." mean? I dont know this abbreviation.

Page 7, third paragraph, line 2: "to" should be "and"

Page 7, third paragraph, line 3: it should be "South-West and South-East"

Page 9, second paragraph, line 9: the name is "Cosic et al."

Page 10, third paragraph, line 1: it should be "(fig. 5a)" without "."

Page 10, third paragraph, line 6: "was" instead of "were"

ACPD

8, S3502–S3506, 2008

Interactive Comment

Page 11, second paragraph, line 10: "analysis" instead of "analyze"

Figure 5 labels (a) and (b) should be much larger. The label above the contour plot is too small and most other labels as well

Figure 6: the dates should be written as label above the figure, the best would be to combine Figure 5 and 6 to one, the mode fitting in figure 6B does not look very consistent. The grown nucleation mode particles get another symbol in the evening but in fact it is still the same mode. And I dont believe that the Aitken mode jumps down for a few hours and up again.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 7263, 2008.