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Interactive comment on “Classifying previously undefined days from eleven years of aerosol-particle-size distribution data from the SMEAR II station, Hyytiälä, Finland” by S. Buenrostro Mazon et al.

S. Buenrostro Mazon et al.

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We thank the referee for his/her constructive comments. Our point-by-point answers to these comments are as follows:

"Since the scheme is based on visual inspection of the size distribution data there is a question of how robust it is (especially when separating similar classes such as the quasi event and nucleation mode peak classes). The authors rightly state that physical trends are observed that differentiate the new sub-classes from each other and this helps to validate the scheme. The scheme would be further validated by comparing classifications made by different individuals. Were the days classified independently

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by different researchers and then the resulting statistics compared? If not, did a group of researchers perform the classification to reduce subjective bias (as stated in the previous paper on classification of particle formation events by Dal Maso et al. (2005) where a 3 person group was used). The current manuscript mentions judgement was decided by a panel of researches but does not say how many people were on the panel. Overall this question of robustness should be addressed further."

The referee is correct that as the scheme is based on visual inspection is - being a manual method - not completely free of the influence of the individuals applying it. In this case the original inspection of the data and the initial division into the subclasses was made based on the data from the arbitrarily selected year 2004. The rest of the years were, for most part, initially classified by one person and validated by additional three researchers, different from those that created the scheme. We will add these clarifications and further discussion on the robustness of the scheme to the manuscript.

"The authors rightly point out that there could be a possible overlap between the quasi event and nucleation mode peak classes. The similarity between these two classes is stated but there is no discussion of the difference between the two classes. From the flowchart in Figure 4 it appears that the time of day at which the event is observed is important but this is not stated anywhere in the text."

The main differences between these two classes are: 1) as mentioned by the referee, in the quasi-event class the small particles typically appear and disappear at the same time of day in a normal event day; 2) in the quasi-event class the particles form a clearer and more homogeneous mode, whereas in the nucleation mode peaks class the mean sizes and concentrations fluctuate more in time; 3) the mean size of the nucleation mode peaks is typically larger than the mode in the quasi-event day. We will add these clarifications to the revised version of the MS.

"Also it would be helpful if the authors gave a possible explanation for why the nucleation mode and Aitken mode peaks are observed. Are they a natural or anthropogenic

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phenomenon? The seasonal pattern of the ultrafine peaks class is unique (with max in winter and secondary max in summer) and it would be interesting to hear some suggestions of where these particles are coming from."

The sources of the nucleation and Aitken mode peaks are not completely clear, but probably they are of anthropogenic origin, as also the concentration peaks related to gaseous-phase pollution. Their seasonal behaviour (maximum in winter) is in line with this interpretation, as in Finland a quite significant increase in heating is required in the winter, and consequently e.g. burning of wood increases. This produces small particles that could contribute to the peaks classes. Traffic is of course a possible source of these small particles as well. The sources of these particles could even be quite small and local (particularly as they are not correlated with gaseous pollutants).

The sources of ultrafine mode peaks in the summer are more difficult to pin down: they might be a mixture of traffic-related local pollution and maybe even small particles originating from failed events.

The referee also points out the local maximum in the ultrafine mode peaks class in the summer. This feature might be actually more statistical in nature than a result of any actual physical process: the slight local minimum in the spring time probably results from the fact that the number of event days is clearly largest in the spring. This will result in fewer days in the "undefined" pool and thus also fewer days to be classified as ultrafine mode peaks - as only previously undefined days were analysed in this study.

We will add this discussion on the sources of the particles in the peaks classes to the revised version of the MS.

"Page 12677, line 27: 1628 previously undefined days was given as 1630 earlier in the text."

The referee is correct - 1630 is the right number. We will correct that to the revised version of the MS.

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"Table 1: Table could be formatted better to indicate that quasi and tail events are subclasses of failed events and nucleation and Aitken peaks are sub-classes of UF mode peaks. The table also shows that the Aitken-mode (10-100nm) and nucleation mode (3-30nm) peak classes overlap. What happens when there is a peak at 20nm that does not grow? This goes back to the robustness of the scheme."

We agree with the referee. We will modify the table so that the subdivision becomes clearer, by e.g. indenting the data or using bold font where needed. We will cover the topic of overlap between the failed event and UF mode peaks classes in the better discussion of the typical appearance times and mean sizes of the particles in these two classes (see the answer to the second comment for details).

"Table 2: I think 1859 total undefined days should read 1861. And again formatting could be better to indicate the sub-classes more clearly (as with Table 1)."

The referee is correct - 1861 is the right number. We will correct that to the revised version of the MS. We will also modify the formatting (e.g. by indention) so that the subclass division is more clear.

Interactive comment on Atmos. Chem. Phys. Discuss., 8, 12665, 2008.

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