**Atmospheric
Chemistry
and Physics
Discussions**

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.

Anonymous Referee #1

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General comments:

This manuscript presents a more detailed scheme for the classification of new particle formation events than is currently found in the literature. The scheme is applied to a significant dataset; 11 years worth of continuous particle size distribution measurements at SMEAR II station in Hyytiälä. This refined classification scheme is warranted by the large amount of previously unclassified days (40%) at this measurement station. The manuscript effectively shows that these "undefined"; days can be classified into a further three sub-classes and that this is a useful process as it helps to elucidate

the conditions favourable to new particle formation. The manuscript is well written and suitable for publication in ACP with some minor adjustments.

Specific comments:

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 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 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. 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 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.

Technical corrections:

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

Table 1: Table could be formatted better to indicate that quasi and tail events are sub-classes 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.

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).

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