Atmospheric
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Discussions

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# Interactive comment on "Simplifying aerosol size distributions modes simultaneously detected at four monitoring sites during SAPUSS" *by* M. Brines et al.

**Anonymous Referee #1**

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General comments

This manuscript provides valuable information about the size distributions of submicron and especially ultrafine particles in Barcelona, describing the patterns and the dynamics when moving from the urban center to suburban areas and focusing on the emissions from vehicles. The manuscript is well written and describes the summarized size distributions around a Mediterranean urban center and it should be published after some minor revisions. A first general comment would be that the section 3.1 is unnecessarily too long, all the information contained are summarized in Tables 1-4. Instead of describing in detail all the elements of the Tables, a single paragraph highlighting the

most interesting features should be compiled. It would be most useful for the reader to add two maps in the manuscript illustrating the locations of the monitoring sites and the main trajectories described. Additionally, the paragraph 4.3 should be improved and expand the analysis. The contribution (or not) of new particle formation processes in the number concentrations reported are not explained in detail, since there are only three events observed during the period under study, perhaps it would be interesting to study explicitly these events. Finally, in the same paragraph, except of a weak correlation to RH, practically no other correlation is illustrated to meteorological parameters. It would be interested to investigate more the breeze effect by examining wind speed and direction.

Specific Comments

Page 27394, line 13: In Fig.2, Fig2a is the legend. All the references hereafter in the text to Figure 2 have to be corrected.

Page 27394, line 16: What are the limitations of averaging over an hour time period? The transformation and evolution of size distributions within an urban environment can be very fast. Reducing the averaging period to the half, or even to a quarter of an hour, may give additional information especially when talking about transport and transformation between the monitoring stations with an Eulerian approach.

Page 27398, line 16: The maximum occurrence for Traffic-2 is during the night, probably with maximum values at midnight. Therefore it is not associated to rush hours, rather heating or cooking activities in the urban area could result to such trend. On the other hand, Traffic-1 looks as if follows the daily traffic patterns.

Page 27399, line 12: Traffic-3 cluster is probably affected by photochemical processes, it has the second more intense solar radiation association after the NU cluster

Page 27400, line 6: RB percentage is 15 % in the table. There are several places in the manuscript that the numbers are inconsistent to those of the tables.

Page 27401, line 4:In supplementary material (Figure S2.j)for NU cluster at UB station high CO values are observed, the second after Traffic- 3. How do you explain these levels, is it possible that in the clustering process, traffic sources are mistreated as nucleation? What about BC values, they are not available in Table 2 for UB for this cluster even if it is available for the other clusters. What is the availability of these data? In this cluster also PM10, PM2.5, N are really high as well.

Page 27401, line 6: The authors report a nucleation size mode at 14nm. However their harmonized dataset has a lower size bin at 15 nm. How was the calculation made, what dataset was used and is it valid after all to report a mean mode diameter outside the size range of the dataset used.

Page 27404, line 5: The peak according to the Table is 16 nm, please keep consistent to the Tables.

Page 27406, line 26: How is the contribution of nucleation processes to the total number concentration calculated?

Page 27407, line 4: "Hence, this section aims to investigate the effect of meteorology on N emitted in traffic hot spots during SAPUSS." Rephrase this sentence.

Page 27407, line 10: What does the R-squared value reported here represent?

Page 27407, line 27: The rest of this paragraph is only weakly demonstrating some dependence on RH, after several restrictions. Additionally, there is too much is discussion about Figure S5 that if the authors believe is so important for interpreting the data should be incorporated in the manuscript.

Page 27407, line 8: R-squared values ought to be positive.

Page 27407, line 25 –line27: These sentences should be in the caption of the Figure.

Page 27409, line 5: The same analysis would be interesting for CO concentration as well.

Page 27410, line 13: "This study shows that meteorology strongly affects the concentration of ultrafine particles of secondary origin." This is not shown in the manuscript.

Page 27410, line 16: "This study also clearly shows that evaporation of traffic-related ultrafine aerosols occurs when the air mass move away from the traffic hot spot." This is not clearly shown in the manuscript it is rather hypothesized.

Technical Corrections

Page 27396, line 1: The percentage is 30%

Page 27409, line 16: Correct Figure 5f to 4f.

Page 27418,Table 4: It is not clear what is highlighted, explain in detail or correct( eg. WS of RB1)

Page 27419, Figure 1: Change the scale in the middle panel so that the distributions become apparent. The size distributions displayed are beginning from 10 nm. Once again, what is the fitting and averaging tools you use? Why the distributions do not start from 15 nm?

Page 27420, Figure 2: The data presented here cover the 02:00-23:00 time frame and the other hours are neglected, fill in the rest of the hours . Furthermore, replace counts to frequency or fraction so that a relative contribution can be estimated

Page 27422, Figure 4: In the print out this Figure is not clear, better resolution would be appreciated.

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 27387, 2013.