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Atmospheric Chemistry and Physics Discussions

Interactive comment on "A study on the relationship between mass concentrations, chemistry and number size distribution of urban fine aerosols in Milan, Barcelona and London" *by* S. Rodríguez et al.

Anonymous Referee #1

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In the manuscript of Rodríguez et al., authors give a comprehensive survey on the relationship between mass concentrations, chemical composition and number size distribution of urban fine aerosol. The study of the relationship among these parameters is of scientific importance, since these results can contribute to the understanding of the complex aerosol system. The work is based on one-year monitoring data from three different cities (Barcelona, London, and Milan). In the paper huge amount of data is presented in very detailed form. The main objectives of this paper are well defined and presented. In this work the authors studied the daily, weekly and seasonal evolution of

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the urban aerosol by means of meteorological information and aerosol microphysics. Their results clearly show that the behavior of the aerosol system - mainly in big cities - is rather complex, it is affected by large variety of -sometimes competitive- parameters. The role of aerosol microphysical processes is very well demonstrated in this work (see the discussion of the relationship between PM2.5 and number size distribution in paragraph 4.5).

1) Does the paper address relevant scientific questions within the scope of ACP? Yes

2) Does the paper present novel concepts, ideas, tools, or data? Yes. It contains new and comprehensive data series from three cities. The involvement of microphysical processes in the evaluation of different aerosol parameters can be considered as new concept. The presentation of these processes applying field data is the main achievement of this work.

3) Are substantial conclusions reached? Yes. The main conclusion of the authors is that microphysical processes and meteorological parameters significantly affect the aerosol mass and number concentrations, the chemical composition and size distribution.

4) Are the scientific methods and assumptions valid and clearly outlined? Yes

5) Are the results sufficient to support the interpretations and conclusions? Mainly yes (see comments)

6) Is the description of experiments and calculations sufficiently complete and precise to allow their reproduction by fellow scientists (traceability of results)? Mainly yes (see comments)

7) Do the authors give proper credit to related work and clearly indicate their own new/original contribution? Yes

8) Does the title clearly reflect the contents of the paper? Partly, yes. I recommend indicating the role of microphysical processes in the title.

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9) Does the abstract provide a concise and complete summary? Yes.

10) Is the overall presentation well structured and clear? The structure of the paper is clear, however, the overall description and evaluation of the results is rather concise, which sometimes makes difficult to understand and digest them. On the other hand, sometimes the figures do not contain or do not fit to the data which are referred in the text. (see comments)

11) Is the language fluent and precise? Yes.

12) Are mathematical formulae, symbols, abbreviations, and units correctly defined and used? Yes.

13) Should any parts of the paper (text, formulae, figures, tables) be clarified, reduced, combined, or eliminated? Yes, to my opinion the number of the figures could be reduced (see comments).

14) Are the number and quality of references appropriate? Yes

15) Is the amount and quality of supplementary material appropriate? Yes.

Minor and technical comments: -p.611, lines 9-14: What kind of factors did you use? It would be nice to see how these concentration values are comparable?

-p. 612, lines 23-25: I can't see the real meaning of this calculation: Ď The difference PM2.5 (Milan) minus PM2.5 (Barcelona or London): 15 ugPM2.5/m3 = 7.0 ugNO3 /m3 + 5.5 ugOM/m3 + 2.5 ugNH+4/m3.".

-p. 613, lines 15-17: "Road traffic emissions result in a higher increase in the concentrations of ultrafine ($<$100 nm) than in the coarser particles (Fig. 4)." On Fig. 4 no concentration values but concentration ratios are shown. For this reason when a ratio increases it does not mean necessarily that the concentration values are higher.

-p. 614, lines 6-9: ĎParticle growth by coagulation in short time scales (hours) is the origin of the low residence time of particles $<$50nm that we have observed, and

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contributes to the above cited high “morning-rush hours” and “daylight” to “nocturnal-background” concentrations ratios (Fig. 4).” How the effect of coagulation can be observed in Fig. 4? The subsequent explanation (based on daily evolution of different parameters) cannot be concluded from this figure.

-p. 614, lines18-19: “the ultrafine particles N10-100 better reflect road traffic emissions than PM2.5 (e.g. observed this at MILAN in Fig. 3a1-b1)” This is obviously true, but in this figure N10-100 concentration is not shown.

-p. 614, lines 22-23: “Observe in Fig. 3 how the above description for the particles >100nm applies for PM2.5 as well.” Again, in Fig 3. N>100 (if Ďparticles >100nm” means number concentration of particles larger than 100nm) is not shown.

-p. 618, lines18-21: ĎĚ the degree of correlation between PM2.5 and the number concentration changes significantly depending on the particle size. Observe, in the examples shown in Fig. 7, how: 1) N>100(nm) shows a good correlation with PM2.5, 2) N10-100 may exhibit concentrations equally high during both high and low PM2.5 concentrations episodes,Ě” In Fig.7 concentration values, not correlation coefficients are presented.

-Figures 3 and 6. contain huge amount of data, which do not necessarily help to understand the results. In these figures even the numbers are hard to see. The figure captions in Fig 3 should be explained (i.e. the numbers before number concentrations). Figures 6.E, F, G, H, I and J are difficult to see, and for this reason in this form they are not very informative.

-Figs. 3 and 5: It is not clear what the role of SO2 is? The SO2 concentration can be found in the figures, but not even mentioned or discussed in the paper.

-Fig 4 A2 and 4B2: This part of the figure is not mentioned, even cited in the text. What kind of additional information (substantial and different from Fig 4A1 and B1) they have?

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-I could not find any evaluation of Fig 5 A3, B3, C3, D3. Are they necessary?

-Why Fig 6A and 6E (both showing PM2.5) are so much different?

-Fig 9A: Why correlation coefficient is much better in Milan than in London or Barcelona?

-Fig. 9B: This figure contains additional information compared to Fig. 9A?

Interactive comment on Atmos. Chem. Phys. Discuss., 7, 605, 2007.