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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Morphological, chemical and optical absorbing characterization of aerosols in the urban atmosphere of Valladolid" *by* S. Mogo et al.

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This study is a characterization of particles in the urban atmosphere of Valladolid using electron microscopy, dispersive X-ray analysis, and light attenuation to evaluate the chemical composition and light absorption. The intent of the study is to provide an additional data point in the worldwide matrix of particle property measurements that are used to better understand the impact of aerosol particles on climate. In addition, these measurements, when complemented by other atmospheric variables, can be used to improve our understanding of the physical processes that control the production and

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evolution of atmospheric particles.

The measurements, while not comprehensive, are useful if they can be put into context, i.e. in addition to tabulating and discussing the results as they relate to the local area, they require a deeper level of analysis than is currently provided. If I interpret the results correctly, the reported information comes from 16 filters over a period of six months. This is a very small data set to try and report any statistics; hence, the researchers should provide us with additional analysis that relates the composition and shapes of these particles to the physical processes that produce and modify these particles. This suggestion is further discussed in the comments below.

In summary, however, I am recommending this manuscript for publication, but ask the authors to take into consideration the issues that I raise, particularly those that concern the analysis of the measurements. The Journal of Atmospheric Chemistry and Physics is a scientific journal and the articles that are published therein should reflect this.

Questions, comments and concerns

Section 2.1

1) The measurement site is on a small balcony on the second floor of a four story building. The authors state that this location shields them from southerly winds but that this is irrelevant to the current study. It is very important to justify this assumption. I am assuming that the measurements are averages over all wind directions. If the sampler is measuring stagnant air when the winds are from the south, or even more problematic, if the southerly winds are eroding material from the building that is finding its way into the sampler, this will bias the sample with spurious data. This is why samples should be stratified by average wind speed and direction, if possible.

2) Samples were 8–15 hrs, but from what time of the day?

3) It is mentioned that fog is common but not if samples were taken during fog. Fog events could be important in particle removal.

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Section 2.3

4) How much time between the transmission measurement of the clean filter and loaded filter?

5) Were any measurements done to see how much the reference varied over time, i.e. were transmission measurements made through a blank filter over a period of several days to see if it varies with age?

6) Were the filters preconditioned?

7) What is the estimated uncertainty, given that no corrections are made for the scattering?

8) Couldn't the scattering be estimated using Mie calculations and the size distribution of the different chemical components found on the filter?

Section 2.3

9) Graphitic carbon is not soot (line 12).

10) Explain how each shape is defined, for example what is the difference between prolonged, irregular and agglomerate? These shapes should be identified on the photographs.

11) What is the purpose of numbering single, small paragraphs? Sections 3.1.1–3.1.4 should be combined into a single section.

12) How many particles of each type?

13) How many filters?

14) How many particles were analyzed per filter?

15) Why not convert the number to number concentrations?

16) Diurnal samples?

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17) Were only 16 filters taken? This is the number of data points that I count on the graphs in Figs. 14–17.

18) There is no justification to report percentages to two significant figures.

19) A single table would be preferable to four tables, i.e. four groups of four in the columns, composition by row and organize groups by size or by shape.

For example:

Element	Chain				Irregular				Spherical				Prolonged			
	<1 μm	1–2.5	2.5–10	>10	<1 μm	1–2.5	2.5–10	>10	<1 μm	1–2.5	2.5–10	>10	<1 μm	1–2.5	2.5–10	>10
S	0	0	0	0	4	3	6	12	15	0	0	0	0	0	0	0
Cl	0	0	0	0	0	27	33	15	0	0	12	0	0	0	0	4
Si,Ca	0	0	0	0	4	22	18	31	4	0	3	0	0	0	6	12
Zn	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	0
Al	0	0	0	0	0	0	0	4	0	0	0	0	0	0	0	4
C	42	30	9	12	0	0	0	4	31	11	0	0	0	0	0	0

Element	<1 μm				1–2.5 μm				2.5–10 μm				>10 μm			
	Chain	Irr.	Sphere	Prlng	Chain	Irr.	Sphere	Prlng	Chain	Irr.	Sphere	Prlng	Chain	Irr.	Sphere	Prlng
S	0	4	15	0	0	3	0	0	0	6	0	0	0	12	0	0
Cl	0	0	0	0	0	27	0	0	0	33	12	0	0	15	0	4
Si,Ca	0	4	4	0	0	22	0	0	0	18	3	6	0	31	0	12
Zn	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	0
Al	0	0	0	0	0	0	0	0	0	0	0	0	0	4	0	4
C	42	0	31	0	30	0	11	0	9	0	0	0	12	4	0	0

20) What is the difference between (Al,Fe) and Fe?

Analysis!

21) What is the significance of the different shapes for different sizes and different compositions? For example, when are sulfur containing species spheres and when are they irregulars?

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22) How can Cl containing particles be irregular and spherical at 2.5–10 μm?

23) How do the geometric sizes compare with the aerodynamic sizes? Are the geometric sizes larger and if so can something be said about the particle shapes and densities?

24) Analysis should include relationship to winds, precipitation.

25) Figure 6 refers to an X-ray spectra in Fig. 9, but since Fig. 6 shows a particle made of NaCl, then the spectra shown in Fig. 8 should be the one referred to, not Fig. 9.

26) In Figure 11, show the number of particles that were analyzed in each category.

27) How do absorption coefficients relate to chemical analysis and to other cities of similar size and population?

28) Absorption and scattering coefficients can be derived from the chemical composition. You have sizes and can estimated using Mie theory.

29) Maybe the change in absorption is significant, considering the narrow wavelength band. What have other studies shown?

30) The inverse relationship with wavelength is expected from theory. Should show this theory and relate it to the imaginary component of the refractive index.

31) Error propagation is necessary but need to list what the error sources and estimated magnitudes are.

32) There is a lot of dust present, or at least a lot of silicone, so these might be contributing to the absorption.

Interactive comment on Atmos. Chem. Phys. Discuss., 5, 3921, 2005.