**Atmospheric
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Discussions**

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Comment

Interactive comment on "Organic aerosol components observed in worldwide datasets from aerosol mass spectrometry" *by* N. L. Ng et al.

Anonymous Referee #2

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The manuscript "Organic aerosol components observed in worldwide datasets from aerosol mass spectrometry" presents an analysis of the organic fraction in submicron aerosol mass from a set of measurements obtained with the Aerodyne Aerosol Mass Spectrometer.

Although most of the data presented in this paper has been published before (Zhang et al, 2005 and 2007; Jimenez et al., 2009; etc...), the factor analysis performed by the authors is interesting and unique enough to justify a publication in "Atmospheric Chemistry and Physics" if the following issues are adequately resolved by the authors.

One very important point is the use of the terms "low-volatility oxygenated organic aerosol" (LV-OOA) and "semi-volatile oxygenated organic aerosol" (SV-OOA) through-

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Interactive Discussion

Discussion Paper

out the paper. These terms describe organic mass spectra that differ in quality as determined through use of a mathematical separation method. The authors state that what is called LV-OOA in one dataset could be SV-OOA in another due to the site dependence of this analysis. Nevertheless, the terms SV-OOA and LV-OOA are used throughout the article almost as if a site independent quantity had already been defined, which is not the case. As of yet, these designations have little or no relevance as analytical terms for classification of different organic aerosol fractions in general and as such should either be omitted or used only with great caution. If the authors insist on using these terms, then much more attention should be payed to the context and consequences of their usage.

Figure 1 shows typical mass spectra for LV-OOA and SV-OOA for a single measurement site. However, they are presented in a way that might mislead the reader into assuming that these are typical mass spectra for these classes. This figure should be removed to avoid any misconception.
Similar misconceptions arise in making comparisons to organic compounds, for instance comparing LV-OOA to HULIS. This should not be done in the absence of a fixed definition for LV-OOA.
The usage of these terms (i.e., LV-OOA and SV-OOA) should be minimized or completely eliminated to avoid the consolidation of these terms as analytically defined classes!

Although section (3.3) is entitled "Comparison with laboratory data", a large part is dedicated to comparison between different chamber experiments rather than comparison between ambient and laboratory generated data. Furthermore, a large fraction of these chamber experiments were performed using very high organic mass loadings. These conditions might be irrelevant for atmospheric conditions (see, for example, Shilling et al., 2009). For instance, Figure 9 compares different chamber

Interactive Comment

experiments in which biogenic precursors exceed even oxygenated organic aerosol mass concentrations in highly polluted urban areas.

A small point of criticism is the title. Since all measurements originate from the northern hemisphere and mostly from highly populated urban areas, I don't think that "worldwide" is appropriate. Furthermore, there is no real separation between urban, rural and remote datasets. They are instead classified as either "urban" or "urban downwind/rural/remote". This suggests that all measurements have been anthropogenic influenced. It would have been much more interesting and helpful if there had been a real separation between "clean" remote, rural and urban influenced datasets, even if that would have meant a reanalysis and separation of individual datasets.

Specific comments:

Abstract: I think, the abstract should more clearly emphasize the main idea of the paper - the mathematical separation of aerosol mass spectra into two different types (f44, f43). This would strengthen the position of the paper and its uniqueness despite the fact that most data has already been published.
While f44 is introduced as the ratio of m/z 44 to total signal in the component mass spectrum, this is not done for f43. I assume f43 is the ratio of m/z 43 to the total component mass spectrum?
In general, the use of abbreviations within the abstract and the whole manuscript is excessive.
Within the abstract, the use of the designators LV-OOA and SV-OOA is misleading, as mentioned before.

P27747, L1: "In this study we present results from the factor analysis of 43 aerosol

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Interactive Discussion

Discussion Paper

mass spectrometer (AMS) datasets".
This is in contrast to the statement in the introduction: "In this work, we apply factor analysis on 27 AMS datasets".
Also, "AMS" is introduced as "aerosol mass spectrometer (AMS)" while later (P27748, L6) it is redefined as Aerodyne Aerosol Mass Spectrometer (AMS).

P27748, L12: (Paatero and Tapper, 1994) and/or (Paatero 1997) should be cited when PMF is first introduced.

P27748, L24: I assume, BB POA stands for "biomass burning primary organic aerosol"?

P27760, L14ff: "In order to allow accurate parameterizations of SOA formation and evolution in the atmosphere, it is desirable that the laboratory conditions be as representative as possible of those in the atmosphere."
How representative are the conditions in the laboratory studies? The organic mass of the biogenic precursors of these studies exceed those found in urban environments by one order of magnitude.

Figure 1: I would suggest removing this Figure and all according statements from the manuscript. See the comments above.

Figure 6: The lines representing the ranges are very confusing.

Figure 10: Why is m-xylene shown in this plot? Also, since neither organic loadings nor OH exposure are responsible for the differences in f44, there is no point in color

coding these data points. If the authors wanted to make the point that the f44 values from datasets are not comparable due to differences in laboratory conditions, i.e., chamber size, then why show this Figure at all? It raises the question as to how intercomparable laboratory experiments are in the first place.

Figure 11: By connecting the data points the plots become messy for regions where data points are dense. Also, it is unclear in which direction f44 changes. I would suggest coloring the data points with different colors representing each successive experiment, like it has been done in Figure 10 for the organic loadings.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 27745, 2009.

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