

Interactive comment on “Characterization of the sources and processes of organic and inorganic aerosols in New York City with a high-resolution time-of-flight aerosol mass spectrometer” by Y.-L. Sun et al.

Anonymous Referee #2

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The authors report mass concentration, chemical composition and size distribution information on the aerosol species measured at an urban site in New York City. The majority of the aerosol is composed of organic aerosol and inorganic sulfates. Five distinct aerosol organic constituents are observed. In addition, there are several key findings reported in regards to the semi-volatile composition, elemental composition, and organic mass to organic carbon contributions.

The subject matter is relevant and of interest to the larger scientific community. The measurements and correlations add to the existing body of work on atmospheric

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aerosol composition based on aerosol mass spectrometry measurements. The document is fairly dense and contains large amounts of information. The paper will be a useful reference. The following concerns will clarify minor points in the paper.

MAJOR CONCERNS

The black carbon and elemental carbon measurements presented are somewhat confusing. There are different measurement/estimation techniques used to characterize each and it is not always clear to the reader which are presented at what time. For instance, the DMT single-wavelength Photoacoustic Soot Spectrometers (PASS-1) is an optical measurement, and as such measures BLACK carbon (BC). The filter based Sunset Lab OC/EC Analyzer is a volatility based measurement and hence measures the ELEMENTAL carbon (EC). The authors note (P22682. L10.) “that the EC in this paper refers to optically measured EC with higher time resolution”. This is misleading in that the EC in this paper is either optical or thermally measured and interchangeably used (refer to subsequent sentence) and that EC should classically refer to the volatility measurement (even though the R^2 between EC and BC is > 0.8). How does the mass observed in Fig 6 (based on m/z 57) compare to that of the PASS-1? Or the average mass from the Sunset OC/EC Analyzer?

How is total OC determined from the Sunset Lab Analyzer data set? (P22680. L28.)

P22681. L25. “The decrease in sulfate . . . probably due to ultra low sulfur diesel fuel” justification is a concern of the reviewer. The data presented is a three-week study in the summer months in 2009. Is it statistically relevant to compare the average of this data set to the average SO₂ emissions in 2001?

The authors and previously reported works show a distinct smaller mode of particles from primary emissions. This is consistent with already published works of McFiggans et al, 2005 and Asa-Awuku et al., 2009. In short, McFiggans et al., 2005 reported that in 4 urban and polluted locations a smaller, externally-mixed organic mode existed. Asa-Awuku et al., 2009 also observe the POA, (traffic-related species) to be at smaller

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sizes and compared to the more oxidized SOA species at the larger sizes.

Fig. 6. Is somewhat misleading. The EC distribution is not shown. In fact it is the corrected m/z 57 signal that is used as a surrogate for EC composition. This should be mentioned in the caption.

What is the rationale for determining the mixtures of the species? External versus internal mixture? Please elaborate. This may not be clear to all readers how AMS data (specifically PTOF data) can be used to assume the mixing state of the aerosol.

What is the size of particles that contain the COA species? That is how does COA-component particle number compare to particle mass? If the COA particles are found in the larger particles then they would clearly dominate the mass. However in terms of number, the COA may be negligible. This concern stems from the authors suggestion that “densely populated metropolitan aerosol should focus on controlling both cooking and traffic emissions” (P22691. L20.)

P22693. L10. What is the correlation between winds from Atlantic ocean with hi-NOA? Is there a large R^2 value with wind direction?

Fig. 9. What is the R^2 correlations with the total OA spectra?

MINOR CONCERNS.

P22676. L11. O.D. not defined.

P22677. L19. Which version of PIKA is used?

P22678. L28. Insert comma. “ the rotational forcing parameter, f_{Peak} ”

P22680. L9. Replace “Pittsburg” with “Pittsburgh”

P22689. L2. What is O_x ? Is it the monoatomic or diatomic oxygen contribution? Or simply the entire elemental oxygen contribution?

References:

McFiggans, G., et al. (2005), Simplification of the representation of the organic component of atmospheric particulates, *Faraday Discuss.*, 130, 341 – 362.

Asa-Awuku, A., M. A. Miracolo, J. H. Kroll, A. L. Robinson, and N. M. Donahue, Mixing and phase partitioning of primary and secondary organic aerosols, *Geophys. Res. Lett.*, 36, L15827, 2009

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