**Atmospheric
Chemistry
and Physics
Discussions**

Interactive comment on "Characterization of near-highway submicron aerosols in New York City with a high-resolution time-of-flight aerosol mass spectrometer" *by* Y. L. Sun et al.

A. Aiken (Referee)

allison.aiken@gmail.com

Received and published: 19 January 2012

Summary

This manuscript describes a dataset of physical and chemical aerosols from a near highway field site. Size distributions are analyzed by PMF for OA analysis and increased chemical composition information over most roadway studies. The paper is straightforward and concise, and the information conveyed is worthy of being published in ACP. I recommend this paper for publication with revisions after the general comments below are addressed.

Most of the general comments echo those already made by the other two reviewers.

C14497

The main issues are dealing with the July 27 data, detailing how the different periods were defined and the significance in those definitions, and in making sure to not over-generalize the implications of the measurements in the abstract and conclusion sections. The data does not need further justification beyond what is presented here, detailing near highway emissions with size-resolved chemical composition. However, if the statements discussed below in comment #3 (and in comment 3 from Reviewer #1) are to be kept, an increased connection between the measurements and the implications stated would be necessary.

———————

General Comments

1. In agreement with reviewer number 1, the comparison of AMS and FMPS data should be elaborated upon. In particular, it would be nice to see the AMS and FMPS data on a mass-averaged plot as the two measurements expand the size range of measured particles in addition to comparing the data from two different measurement techniques.

2. As both previous reviewers have mentioned, based on Figure 1, it does not seem clear how highway vs bus emissions could be distinguished since they are both north of the sampling site (discussed around L274). Please look into these details and explain them further. I would also recommend improving the labels used in Figure 1 and throughout the text as it would be much simpler to name the locations LIE, QC, DEC, and bus stop rather than the letters and parking lots, which could be included in the text, but do not help the reader readily assess which site is being discussed. In addition, I suggest using wind rose directions rather than up and downwind for easier interpretation by the reader.

3. In agreement with Reviewer #1's general comment #3 and Reviewer #2's specific comment #11, I also think the authors have put the motivation and applications of this manuscript in too broad of a context. I fail to see how the results relate to individual

C14498

exposure rates which are much more complex than a set sampling location as is used here. The paper is important and stands on it's own as a chemical and physical characterization of aerosols sampled near a highway . The research can be justified with these motivations alone. The sentences about the oxidation or photochemical reactions of the aerosols are not addressed and it should not be implied that they are, and any implications of seasonal variability of roadside aerosols are also not addressed in with this short sample period, and it should not be implied that anything is known about that from the data discussed here. I suggest that these sentences (i.e. L51-54, L448-454) be less generalized and or removed without providing further substantiation. Also, (L447) the conclusions about morning and evening periods should be stated in a way that is more descriptive of the measurements made here and less generalized since this sample size and time period is very small, and with one evening period it seems there is not enough information to make generalizations about morning/evening differences based on this data alone, and that the conclusions should be more centered on this specific dataset and only have the potential to suggest such assumptions for other locations and time periods.

4. The July 27th data needs to be either fully included or excluded. I recommend mentioning it, but moving it's analysis and discussion to the supplementary information. The way it is presented now, included in all the plots, but disregarded in the text is not desirable and just adds confusion for the reader. I tend to agree with Reviewer #2 in that it should be excluded from the plots. I realize that this is not desirable since then there is only one PM period, but only one PM period is fully analyzed currently. The analysis could be moved into the supplemental information for completeness, but the way it is currently it does not add to the discussion, but actually detracts since it is disregarded in the text. I am not against fully analyzing it and adding it to the text, but if this is to be done, also in agreement with Reviewer #2, the PMF factor needs to be included in Figure 7 for completeness. Clearly, exclusion of this day requires toning down the generalizations about the PM analysis, but this is recommended anyway since the data is for such a short sampling period.

C14499

5. Please address how the delineation between LT and MT periods was determined. As the text (L266) is not clear if they were determined by external factors (observations?, measurements?, etc.) to the AMS data or if they were based on differences in the profiles of the mass concentration time series of AMS species. Line 280 implies they were based on external observations of traffic flow, but this is not clear.

6. Are morning and evening the most accurate titles for the different sampling periods? One of the "evening" periods starts at 2:50pm. If this sample is included (July 27), I recommend naming the periods something less specific, such as AM and PM.

_____

Specific Comments

1. L92 – The sentence implies a causal relationship. Is this intended?

2. L102 – PM0.18? Is this a common unit? If not, please define, as it was unclear to me.

3. L125 – move DeCarlo et al. to after < 100 in the previous line

4. L127 – suggest citing Ulbrich et al. 2008

5. L167 – suggest describing the inlet or adding a citation that references such information

6. L168 – suggest adding something like mass-sensitive to imply what V-mode is sensitive to

7. L220 – should this not say "internal tracer method" to make it clear that there is not a tracer external to the AMS measurements being used for the size distributions

8. L231 – I am not quite clear on how the HOA size distribution was derived. I suggest adding a few more details to let the reader know whether the average fraction of $C_4H_9^+$/m/z 57 is used or whether this value uses the fraction present in each sample.

C14500

9. L252 – What does the LV-OOA mass concentration time series look like from the QC/Lot 6? Does it support the interpretation mentioned here?

10. L256 – SV-OOA also appears to increase quickly around 6:30am on July 28th. Why is this not mentioned?

11. L257 – The organics still appear to have sharp changes. Do the inorganic species co-vary with them? Could R2 values be used to justify this qualitative statement?

12. L265 – suggest adding the range of organic percentages sampled, possibly divided into AM and PM periods if statistically different.

13. L274 – suggest using a wind rose direction rather than the term upwind here and in all subsequent references in order to be clear to the reader.

14. L294 – could this hypothesis be supported by bus schedule times if not recorded observations? If not, please state what the assumption is based on.

15. L299 – Should SOA not be OOA? A sentence could be added to clarify the relationship if deemed necessary, but all other statements use the AMS factors, i.e. HOA and OOA, and not the broader terms POA and SOA.

16. L303 – July 27th also appears to have a bimodal size distribution, yet this is not discussed.

17. L309 – Could a plot of this be added or at least R2 values to qualify the statement?

18. L331 – I suggest softening the language about the internal mixtures to saying that this implied, unless it can be further supported.

19. L345 – suggest deleting the sentence about exposure estimates as per the reasons mentioned above in the general comments

20. L392 – suggest adding this plot

21. L401 – why was the background calculated using the MT period? If this was

calculated with the LT period, how would it compare?

22. L406 – I suggest adding the range of ER values from Canagaratna et al., 2004.

23. L414 – How does this EI compare to other published values? Could some of those be added here and discussed for comparison? It also could be beneficial to have a little more detail about how the emission ratio is converted to an EI if it could be simply stated as a quick reference for the reader.

———————

Figure Comments

1. F2 – Add the detail in the text that the MET data is from a different site than the other measurements.

2. F4 – Add the detail in the text about the red/MT and yellow/LT data points. Update the textbox in the figure as it is confusing that it is only in the Organics(a).

3. F5 – What are the black and grey lines in a? L725 change (a) to (b). L726 light grey lines are not visible.

4. F9 – Why is there data missing in a (July 27) and b (July 27 and 28)?

———————

Technical Comments

1. L38 – change "mush" to "much". Also consider replacing smoother with smaller.

2. L47 – define FMPS

3. L59 – change "of" to "in"

4. L64 – is there a quantification or reference that could be included here?

5. L66 – Define COPD

6. L91 – should >10 nm be >100 nm?

7. L119 – remove however

8. L122 – delete relatively and check the grammar of this sentence

9. L199 – suggest changing the citation for APES and PIKA to the format used for SQUIRREL

10. L210 – add a reference to the Supplementary Information

11. L314 – change 5a to 5b

——————

Supplementary Comments

1. L27 – the first figure discussed should be labeled S1 (not S5)

2. FS1 – label all 3 with the sample site location

3. FS2 – add that the shaded areas are divided into the LT and MT periods. Also, the grey period is very hard to see.

———————————————