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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Two years of near real-time chemical composition of submicron aerosols in the region of Paris using an Aerosol Chemical Speciation Monitor (ACSm) and a multi-wavelength Aethalometer" *by* J.-E. Petit et al.

Anonymous Referee #2

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This work reported two years of continuous ACSM measurements at the French atmospheric SIRTA supersite from mid-2011 to mid-2013. It is found that in spring and summer, there is a large contribution of regional background OA. On the contrary, in wintertime, there is a large source of local OA from wood-burning, as supported by BC measurements. A clear weekday-weekend pattern is observed for the different species measured by ACSM as well as BC data. Eight different pollution episodes were identified, representing differing effects of meteorological conditions, sources, and geographical origins on the measured aerosol concentrations. It is suggested that BC/SO4 ratio

is a useful proxy in representing the relative importance of local vs. regional/advected pollution.

The data presented in this manuscript represent some of the first long-term measurements obtained with the ACSM. The analyses were carefully performed and comprehensive and the manuscript was well-written. This work is certainly of interest to the general aerosol community. I only have a few main comments. Firstly, it is important to validate the quality of the ACSM data. While the authors emphasized the "artifact-free" (compared to filters, I guess) feature of the instrument, I think it's also important that the authors mention the uncertainties of the instrument, including calibration uncertainties etc. The authors have performed some comparisons with offline filter data. Unless I misunderstood, the ACSM here has a PM1 lens and it appears that PM1 filter data are available. Thus, it would make more sense to compare their ACSM data to PM1 filter data, instead of the PM2.5 data as shown in Figure 2. Secondly, the authors emphasized the usefulness of BC/SO4 in evaluating the contributions of local vs regional/transported pollution. However, one does not necessarily need an ACSM to obtain real-time SO4 measurements (e.g., one can use a SO4 analyzer). Thus, I suggest that in addition to emphasizing the usefulness of BC/SO4, the authors should point out that the upcoming PMF analysis of the ACSM data would also offer insights into OA sources and processing.

Specific comments

1. Page 24227, line 21. ACSM measures PM1 aerosols (unless they have a PM2.5 lens). Do the authors mean that they used a PM2.5 cyclone at the inlet?

2. Page 24228, line 6. Technically, for ACSM, it should be "response factor" (see Ng et al), not "ionization efficiency". Also, what is the variation in the response factor throughout the whole campaign? How often as calibration performed? What is the data saving interval? (every 30mins?)

3. Page 24230, line 21. Are these TEOM data?

4. Page 24233, nitrate discussion. It is not clear how “no overestimation of ACSM nitrate is observed at high concentrations” would suggest “the ability of the Middlebrook algorithm to properly correct our ACSM collection efficiencies”. If “proper” CE means that concentration of the species measured by the ACSM is in agreement with other measurements, then all other species (sulfate, etc) should also be in agreement with other measurements? (but this is not quite the case).

5. Page 24233-24234. It is not clear why the authors compared the PM1 ACSM data to PM2.5 filter data. It appears that PM1 filter data are available (see Figure 3). They should compare ACSM data to PM1 filter data.

6. Page 24233, sulfate comparison. Can the authors compare their PM1 sulfate data and PM2.5 sulfate data to support their hypothesis that sulfate associated with larger particles is a cause for the difference between ACSM and filter sulfate comparison?

7. Page 24233, line 26. Is it appropriate to compare ACSM OM to PM2.5 OC? Please justify this.

8. Page 24235, line 9. What discrepancies?

9. Page 24236, lines 16. Why such a feature is only observed here but not in previous measurements (Megapoli/Ariparif-Particules projects)?

10. Page 24241, line 4. This citation is for isoprene SOA. Do the authors expect high contributions of isoprene SOA in the region?

11. Page 24241, line 5. It seems that nitrate and OM have a more different diurnal trends on the weekends. Why?

12. Figure 6. Please states clearly how seasons are defined (which month to which month). I suggest using a different color scheme for the seasons, so as not to be confused with ACSM species. It is not clear what the authors meant by “each data point correspond to 1 ACSM measurement”.

13. Figure 7. What is SO42- in this figure? Sulfate measured by ACSM? PM1 filter sulfate? PM2.5 filter sulfate?

14. Figure 8, what is the color scale of the wind rose? Why NH4 data are not included in this figure?

15. Figure 10, why is sulfate data not included here?

16. I think the authors intended to use BC / SO4 to denote local vs. regional/advected pollution. However, throughout the manuscript, there are multiple sentences noting that this ratio is used to denote local/regional vs. advected PM – this needs to be corrected.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 24221, 2014.