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Atmospheric Measurement Techniques Discussions

Interactive comment on "Evaluation of a Sequential Spot Sampler (S3) for time-resolved measurement of $PM_{2.5}$ sulfate and nitrate through lab and field measurements" *by* A. Hecobian et al.

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***The authors would like to thank referee #1 for her/his careful consideration of the manuscript and the comments for its improvement. Responses to each point are listed below.

This paper presents an evaluation of a recently developed instrument (S3) which allows for time-resolved collection of aerosols. The process is designed for minimal manual sample preparation which can reduce the possibility of contamination. Overall, the paper is well written and provides needed evaluation of a potentially useful instrument for aerosol monitoring. The experiments were well designed to determine possible

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contamination, extraction efficiency, and a comparison versus current state-of-the-art instrumentation. However, the conclusions may be enhanced by the inclusion of some missing information and analysis as noted below:

Revisions: 1) The statistical analysis of the comparison to PILS measurements (figure 6) are too simplistic. The good correlation and slope is driven by the values above 4 ug/m3 for sulfate and 5 ug/m3 for nitrate. Above these thresholds the comparison is great. Below them, the comparison falls apart. A residual plot should be made - (S3 Sulfate Minus PILS Sulfate) versus (PILS or S3 Sulfate) – and the uncertainty found as a function of the concentration. Reasons for the discrepancy at low concentration should be discussed including the possibility of the PILS being off (maybe compare PILS values to URG).

***A paragraph has been added to section 3.2 to report the values of r2 and slopes when the top 75th percentile of the data are removed and the residuals of the regression analysis are presented in Figure S1 in the supplementary material section.

2) The paper is focused on sulfate and nitrate which are two major constituents of ambient aerosol but does not mention other constituents. Were other ions measured (chloride, sodium, ammonium, magnesium, calcium ...) or the possibility of organics? If they were, please include. If not, please include a sentence or paragraph on the possibility of S3 analysis for other ions and organics. This would likely include the need to make 2 injections per well (anions and cations).

***A reference and a few lines were added to the conclusions to show that the S3 can be used for the measurement of other constituents including PAHs.

3) p10619, line 7: Please discuss if 1.5 L/min is the maximum air flow allowed for the instrument. Can this be increased for sampling cleaner air? What effects would this have besides messing up the size cut of the cyclone? It should also be noted somewhere that even though this is a fairly low air flow compared to filter sampling, it is made up for by the low amount of water needed for extraction (0.1 mL in comparison

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to 5-10 mL for filters) resulting in more concentrated (L air / mL extract) solutions for IC analysis.

***First part: The range of the flow rate of the S3 was calculated and tested to optimize supersaturation based on the S3 section lengths and temperatures, among other considerations. Hering et al. (2014) have performed and published an in-depth analysis of the system's range of flow rates.

Second part: Thank you. A sentence has been added to reflect this.

Technical Notes:

1) p10612, line 3: "time resolved" should be "time-resolved"

***Done.

2) p10616, line 16: explain acronym or provide manufacturer for the PAL CTC

***PAL is the brand name of the autosampler and CTC its model name. The word "system" has been added in this sentence for clarification.

3) p10616, line 11: "time resolved" should be "time-resolved"

***Done.

4) p10617, line 23: why was LiBr used? If it was used to determine any sample dilution, please explain

***LiBr was used in the laboratory evaluation of the S3 well plates for sample extraction, to ensure any sample/standard loss was not due to the experimental setup. A sentence has been added for clarification.

5) p10617, line 15-27: this section is very repetitious with p10621, lines 12-21. I suggest moving it to section 3.1

***A sentence from section 3.1 was removed to avoid repetition of sample preparation procedures.

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6) p10618, line 28: I believe the tubing you are referring to is made of silicon. If so, please state this

***The word silicone was added before tubing.

7) p10619, line 18: These LODs should be included in the abstract as this is an important finding for a new instrument

***A sentence was added to the abstract with the LOD values.

8) p10619, line 22-23: Please include the reason for the operator intervention

***Done.

9) p10621, line 3: replace “LT” with “local time”

***Done.

10) p10621, line 12: is there a reason to use IC eluent instead of ultrapure water for the extraction?

***IC eluent was not used for the measurements made in this study. However, in some cases, where the pH of the injection may affect the pH of the column it is appropriate to extract the sample with eluent rather than water. To avoid confusion in this manuscript, the reference to IC eluent injection was deleted in this section.

11) p10621, line 16: I believe that 20 should be 15. You state 15 minutes on p10617, line 25 and in Figure 2.

***That is correct. 20 has been changed to 15.

12) p10622, line2 5-15: This paragraph is better suited in section 2.2, likely after the paragraph ending on p10618, line 8

***The authors thank the reviewer for his/her suggestion; however, as this paragraph discusses results of work from lab evaluation of S3, the authors feel that the current location is the appropriate place for it.

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13) p10622, line 22-23: This sentence is repetitious with the first sentence of the paragraph and should be removed. Start the next sentence with Figure 4.

***The sentence was removed.

14) P10622, line 23-26: For completeness you should state that there were also periods of high sulfate/nitrate measured by the higher time-resolution of the PILS but not by the S3 (ie on 6/27 for sulfate and on 7/1 for nitrate)

***The authors agree with the reviewer and had the following sentence in the text, “It shows the clear value of instruments with higher time resolutions (PILS-IC and S3) in being able to capture episodes of high nitrate and sulfate concentrations relative to the more typical, lower time resolution of the URG denuder/filter-pack.” to state this.

15) P10623, line 21: define RSD

***Done.

16) P10633, Figure 6 caption: there is undue capitalization including: Top, Sulfate, and Nitrate.

***The caption for Figure 6 was changed so that top, sulfate, and nitrate are not capitalized.

Interactive comment on Atmos. Meas. Tech. Discuss., 8, 10611, 2015.