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Comment on amt-2022-246

Anonymous Referee #2

Referee comment on "Quantitative chemical assay of nanogram-level particulate matter using aerosol mass spectrometry: characterization of particles collected from uncrewed atmospheric measurement platforms" by Christopher R. Niedeck et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2022-246-RC2>, 2022

Review of Quantitative Chemical Assay of Nanogram-Level PM Using Aerosol Mass Spectrometry: Characterization of Particles Collected from Uncrewed Atmospheric Measurement Platforms by Niedeck et al.

This manuscript presents a method to atomize small volumes of sample into an AMS for offline analysis. The spray is continuous and requires about 100 μL of liquid volume, and shows good comparison with online methods (ACSM). Offline analysis of aerosol samples is beneficial because it allows for characterizations to be made on samples that are significantly easier to collect (compared to flying an AMS). The paper is clear and well written and the work will be of interest to the readers of AMT. My main concerns are some needed clarifications and some corrections to statements made in comparison to prior work. Once these concerns are resolved, I recommend publication in AMT.

- In the abstract and conclusions, the authors list a detection limit in nanograms. However, these samples are coming from solutions and it is not clear what the sample volumes are that these correspond to. If it is the same sample volume used everywhere, please make that more clear. Otherwise, please report the sample concentrations as well as the masses to improve reproducibility of the work.
- On page 3, it is noted that "Since the nebulization efficiency (i.e. the ratio between the mass detected by the AMS compared to the mass of solute nebulized) of the common aerosol generation systems is low, e.g., $\sim 0.02\%$ for an ultrasonic atomizer utilized by O'Brien et al. (O'Brien et al., 2019), liquid volumes of several milliliter and tens of micrograms of sample mass are usually required for continuous aerosol generation and AMS analysis (O'Brien et al., 2019; Sun et al., 2011)." This statement is incorrect for O'Brien et al.. The efficiency is correct, however, the technique used a discrete injection, not continuous flow, and only 4-5 microliters of solution were used per injection. This should not be scaled to flows for a continuous injection as it misrepresents the method and over-estimates the volumes needed.
- The comparison of the UAS samples is welcome and interesting. In section 2.2, how were the blanks collected, handled, and prepared? In section 3.2 it is noted that the

normalized blanks are subtracted from the samples. Were these mass subtractions only, or were the spectra subtracted as well? What did the blank spectra look like compared to the samples?

- The use of isotopically labeled sulfate is a nice quantification method. Have the authors explored the ability to quantify with sulfate when ions like sodium or potassium are present in the sample? These can form salts with high vaporization temperatures and may be a concern for quantification.
- I appreciate the comparisons between the different HR spectra, but I would like more comparison with the online ACSM data. Figure S5 shows the ACSM data for I believe the same time periods as those in Figure 5. However, it is very difficult to directly compare. Please add a figure in the supplemental that is a direct comparison between the two (with the HR data unit mass). The caption on Figure S5 also notes some r^2 values that I cannot find in Figure 4. Please correct this.
- On page 15 no mention is made of differences that can be due to extraction and solubility of the samples. This may not be too large of a concern at SGP, but it may be a concern at other field sites and should be mentioned.