Atmospheric Measurement Techniques Discussions

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Comment on amt-2022-248

Anonymous Referee #1

Referee comment on "Characterization of offline analysis of particulate matter with FIGAERO-CIMS" by Jing Cai et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2022-248-RC1, 2022

Cai et al. present a characterization of the ability of the FIGAERO-CIMS to sample aerosol collected offline and sampled by the instrument. The authors did an excellent job of creating the experiments and methods to investigate different aspects that would impact the overall quantification of the aerosol sampled from the filters. The paper was an enjoyable read and is an excellent paper for AMT. Below are comments for the authors to address to improve clarification and the paper.

Major

(1) In the introduction, the authors have a paragraph stating, "Both online and offline techniques have their advantages and disadvantages and are associated with artefacts...". However, the authors then only discuss the advantages and disadvantages for online techniques. It would be useful for the authors to also briefly discuss the advantages and disadvantages for offline techniques, which also corresponds to some more comments below.

(2) In Section 2.1, the authors mention that they are using a four-channel sampler. It seems that all four channels were being used for filters, but further clarification on how each channel was being used, and if the channels were sequential or parallel would be beneficial. Also, a discussion about any potential sizing effects from the different channels would be good.

(3) In Section 2.1 and others, it is unclear if any artefacts with using filters were investigated -- e.g., uptake of gases, evaporation of aerosol, chemistry on the filters, loss or changing of sampling during storage, loss or changing of sampling in filter preparation. A brief discussion concerning any of these artefacts would be beneficial in understanding this technique for quantification.

(4) In Table 1 and throughout the text, the authors state the amount of OA loading per area punched. It is unclear how the authors quantified this number.

(5) Section 2.2.1.3: With the FIGAERO-CIMS, it has been acknowledged that the ramping process used to sample the aerosol leads to some degradation of the aerosol. A discussion on how the different ramping protocols may impact the evaporation/degradation would be beneficial.

(6) Fig. 3. With the scales being log-log, it's hard to understand/appreciate the differences and which method is best for blank subtraction. Also, the eye is drawn to the low signal/high m/z data, where most of it falls below the 1:1 line for many of the methods. How important is that for the overall quantification?

(7) Check the axis labels for Fig. 4 and Fig. 6. It appears either something is missing or the names were mixed.

(8) In Sect. 3.5, please state what is being compared explicitly (signal from CIMS vs mass concentration from ACSM). Looking at the figure, it takes a bit to understand the axis are different for the two measurements, leading the reader to try to understand how the CIMS appears to have more mass than ACSM and/or the agreement changes.

(9) Fig. 8, label (c) and (d) y-axes with what each frequency corresponds to. It is very unclear what is being plotted by just looking at the figures. In general, all figure axes and/or figure panels should be label more explicitly to better understand what is being plotted.

(10) Something that is missing overall from this paper is what is the ultimate goal of this paper. It is expected that researchers use this method for quantitative information about aerosol or qualitative information about the aerosol? If quantitative, see point (3) above, but there are other aspects that need to be discussed, including but not limited to: (a) percent recovery from filter, (b) more explicit intercomparisons with online measurements (e.g., FIGARO co-located with sampling for direct comparison of what's being observed, how much, and any potential changes of the aerosol prior to offline sampling), and (c) calibrations. For point (c), though the main paper does not show any data in mass concentration, one figure in the SI (Fig. S10) has converted the FIGARO data from signal to ug m-3.

(11) Fig. S6. It is currently unclear how to interpret this figure. The authors stated that Method 2a, 2b, and 4 provide the most reliable/reproducible answer; however, if the value should be a normal distribution around 1, it appears that Method 1, 2b, 3a, and 3b would

be the methods to select. Also, it is surprising that there are no negative values. A distribution of what is expected maybe valuable in this figure to compare to which method is working as expected.

Minor

(1) In Section 2.2.1.2, please check the sequential number in lines 147 - 153, as (3) is repated twice.

(2) As the other methods have examples in the SI, showing an example of Method 4 would be beneficial.

(3) Line 312, please change "background right" to "background correctly"

(4) Fig. 3, the y=x, y=0.5x, and y=0.2x are hard to read and to understand that they refer to.

(5) Line 325, "Evidently" is not the correct word choice. Just start the sentence with "This"

(6) Fig. 10, try to select different colorbars as the red/green leads to issues for color blind.