Comment on amt-2022-248

Anonymous Referee #2

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-RC2, 2022

This manuscript describes and characterizes the use of the FIGAERO-CIMS to analyze particle composition via off-line filter analysis (i.e. filters that are collected outside of the instrument and later inserted in the instrument for analysis). This technique can enable FIGAERO-CIMS analysis of particle composition in a greater number and variety of environments as it does not require moving the instrument. The manuscript is well written and of interest to readers of AMT. I suggest publication of the manuscript after my comments below have been addressed.

Major comments:

Correction and analysis methods: The manuscript is generally unclear on which methods are suggested for future use. For example, the authors conducted background correction in six different ways (e.g. Fig 2), and conducted some analyses to decide which corrections were most consistent with their data. For future work do they recommend that others also correct the background in six different ways? Or are the insights from their analyses sufficient to recommend a subset of methods for future use?

Reagent ion depletion: The authors mention that reagent ion depletion is not desired (e.g. line 155). It was unclear to me from reading the manuscript whether and how they corrected for reagent ion depletion (e.g. by dividing the analyte signal by reagent ion concentration)?

Data from the FIGAERO-CIMS and the ACSM are found to correlate well (e.g. Fig. 7). Do the authors have any information about their quantitative agreement?

The authors find that (lines 540-542) "The variability in Tmax induced by varying PM loadings is within 5°C for 29% of compounds and within 15°C for 54% of all compounds for Quartz filters, and 35% and 57% of compounds, respectively, for Teflon samples." They also summarize (in the abstract) that "we find that Tmax can be determined with high repeatability for one filter type". Taken together, this seems to imply that e.g. a 10°C difference in Tmax (due to filter loading) is acceptable. Is that the case? What volatility difference is associated with a 10°C difference in Tmax? Is that uncertainty / variability acceptable for volatility analysis?

Editorial comments:

- Line 62: The FIGAERO-CIMS data from HOMEChem was recently published in AS&T: https://doi.org/10.1080/02786826.2022.2133593.
- Line 312: I suggest replacing "right" with a different word (and maybe reorganizing the sentence); e.g. "This shows the importance of correctly assessing instrument background…"
- Fig 4d) – should the horizontal axis also be "Quartz"?
- Fig 6b) – should horizontal axis be "Q-punch"?