

Atmos. Meas. Tech. Discuss., referee comment RC1
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Comment on amt-2021-156

Anonymous Referee #1

Referee comment on "Development of an in situ dual-channel thermal desorption gas chromatography instrument for consistent quantification of volatile, intermediate-volatility and semivolatile organic compounds" by Rebecca A. Wernis et al., Atmos. Meas. Tech. Discuss., <https://doi.org/10.5194/amt-2021-156-RC1>, 2021

Review of "Development of an In Situ Dual-Channel Thermal Desorption Gas Chromatography Instrument for Consistent Quantification of Volatile, Intermediate Volatility and Semivolatile Organic Compounds" by Wernis et al.:

Summary: The authors describe a novel instrument configuration called the cTAG, building upon previous TAG instruments. The cTAG includes an I/VOC channel with a separate heated GC column, extending the instrument to sample directly emitted VOCs and IVOCs not previously measurable with the same HRTofMS detector. They also describe a new gas calibration system, the success of an ozone removal system, and the performance of the instrument in several field settings. The paper is clear and well written. The addition of the I/VOC channel will be a useful upgrade to the SV-TAG system. I have only a few substantive comments, and some technical comments. I think the authors should clarify the utility of this instrument a bit, as I suggest in my comments below. I suggest publication after these minor revisions.

Main Comments:

Pg 3 Ln 27: The way this sentence is written, it implies the cTAG can measure *all* precursors and *all* of their related oxidation products in SOA across 15 decades of volatility, but that is not the case. The GC columns are probably quite limited in which oxidation products they can transmit. And while the GC does provide speciation of isomers, there are other instruments (CIMS or PTR) that can measure precursors and a much wider variety of oxidation products (including in SOA with FIGAERO, or some custom PTR inlets) with which you can infer some of the important speciation by comparing with previous GC studies. While the advances in this paper are certainly quite useful and fill an

important niche, I suggest tempering the language here and elsewhere a bit, especially when discussing the abilities to measure the range of oxidation products.

Pg 10 Ln 6: I don't think you need Section 3 as a separate section. When I first read it, I was confused why you weren't showing me any results, e.g. the calibration curves, how the ozone scrubber worked. Then I saw you give the results in basically duplicate sections in Sect. 4. I think it would read much cleaner if you just move the text from Sect. 3 into the corresponding spots in Sect. 4, so it doesn't seem duplicated.

Pg 18 Ln 14: For a casual reader, it is really hard to identify the three groups of correlated compounds in this plot for two reasons. First, it's just a lot to take in. I think it would be very useful to put boxes around the correlated groups to clearly show the reader where to look, e.g., one box around the top left, one box around the correlations from undecade through phytane, and one box around the bottom right correlations. And second, you're discussing these as volatility groups in the text, but the figure doesn't have any of that volatility information. Can you include an alkane equivalent volatility scale, like you do with the dashed lines in Fig 7?

Pg 20 Ln 12: Here is another example where "organic compounds" is too broad, and I think you will help the reader by specifying the subset of compounds that can be measured, e.g., nonpolar, weakly polar, unoxidized and lightly oxidized, etc.

Pg 20 Ln 14: There are certainly other instruments that can measure VOC emissions, reactive intermediates, and secondary products at greater than hourly resolution on a single instrument. Even if you add the qualifier of "speciated", you should again temper the language by explaining the subset of compounds that can be sampled in relation to what is out there in the atmosphere. I'm not trying to put down the GC measurements, I just think there is no reason to overstate the capabilities. The GC is certainly useful for atmospheric measurements, and the reader will be better served by having a clear idea of the cTAG's capabilities and limitations.

Technical Comments:

Pg 5 Ln 11: Here you say the glass beads do not trap I/VOCs, but in the Fig. 2 caption you say the IVOCs are captured on the glass beads. Doesn't matter scientifically, but make sure these are consistent.

Pg 11 Ln 24: When you say "this technique is effective for some sesquiterpenes as well", it

reads like you're saying the sodium thiosulfate is effective for removing sesquiterpenes, since the previous sentence was about ozone removal. I believe you mean sodium thiosulfate is effective for removing ozone artifacts while sampling sesquiterpenes? Please reword.

Pg 13 Ln 10: The "10" line number is somehow in the middle of the table.

Pg 13 Ln 24: It would be helpful to quote your usual sample volume here.

Pg 17 Ln 12: Since you're saying here that the data in Fig 7 come from these several locations, you should probably specify here or in the figure caption which panels (a-f) came from which locations.

Pg 17 Ln 16: Need to define BTEX and PAH.

Pg 17 Ln 18: Use "SVOC" instead of "SV" to be consistent.

Pg 18 Ln 7: Do you have a citation or evidence for conversion of phthalic acid to phthalic anhydride on the collection cell? Maybe not necessary but could be good to document.

Pg 19 Ln 1: In Fig. 7, you should switch your labels to read "I/VOC channel" instead of "VOC channel" to be consistent with the earlier text.

Pg 24 Ln 1: Some journals require all data to be publicly available at the time of publication, e.g., with a doi instead of just upon request. Perhaps the authors will consider adopting this standard even if AMT does not require it, in order to encourage high standards of research in the future.