Atmospheric Measurement Techniques Discussions

Atmos. Meas. Tech. Discuss., author comment AC1
https://doi.org/10.5194/amt-2021-153-AC1, 2021

Reply on RC1

Jan Gačnik et al.

Author comment on "Behavior of KCl sorbent traps and KCl trapping solutions used for atmospheric mercury speciation: stability and specificity" by Jan Gačnik et al., Atmos. Meas. Tech. Discuss., https://doi.org/10.5194/amt-2021-153-AC1, 2021

Dear reviewer,

thank you for the comments. Your comments are marked with bullets.

- Abstract-the authors need to note that GOM and PBM are formed in the atmosphere not just emitted from sources

We have changed the sentence in line 13 which now goes as following: "***GOM and PBM can also be formed in the atmosphere***; their sampling is the most problematic step in the analytical procedure."

- I disagree that the work done at ambient air concentrations are limited. The cation exchange membrane method detection limits are well below ambient concentration

We are aware of the work with cation-exchange membranes, though we were trying to stress that the ambient concentration work on KCl sorbent traps and KCl trapping solutions alone was limited. Ambient concentration work with other sampling methods (i.e. cation exchange membranes) is of course available in the literature. We rephrased this in line 15: "GOM sampling with speciation traps composed of KCl sorbent materials and KCl trapping solutions are commonly used sampling methods, although the work done ***with them*** at ambient air concentrations is limited."

- Line 26- first sentence of the abstract need a reference. Second sentence this is simply not true!

Reference for the first sentence of introduction was added and the second sentence was removed (lines 26-28).

- Line 40 -PTFE membranes are used to collect PBM not GOM. Nylon and CEM collect RM when there is no PTFE in front.

Line 40 was corrected according to your suggestions, the sentences were rearranged in lines 38-42 to: "For gaseous oxidized mercury (GOM) the main sampling and preconcentration methods are: KCl-coated denuders (Bu et al., 2018), KCl impinging solutions (impingers, adaptations of the Ontario Hydro method (ASTM International, 2016)) and KCl sorbent traps (U.S. Environmental Protection Agency, 2017; Prestbo and

Bloom, 1995). ***Cation-exchange (CEM) or nylon membranes collect reactive mercury (RM – sum of GOM and PBM) but can also be used for GOM sampling if poly(tetrafluoroethylene) (PTFE) membranes (PBM collection) are placed upstream of them (Bu et al., 2018; Huang et al., 2013; Gustin et al., 2021)***

- Line 46 start new paragraph with "Most".

New paragraph was added as suggested.

- Line 65- Again, it has been well documented that CEM can be used to measure ambient concentrations.

In line 65 we excluded the following statement about limitation for ambient concentration: "CEM and polyethersulfone membrane (PES) have been shown to be the most quantitative sorbents."

- Line 69- should be that CEM and nylon retain GOM if placed downstream of a PTFE membrane.

Line 69 was corrected according to your suggestions: "Authors suggest that PTFE membranes retain mostly PBM while CEM and nylon membranes retain RM without an upstream placed PTFE membrane or GOM with an upstream placed PTFE membrane (Gustin et al., 2021)."

- I know this may be a bit unconventional, but to make the results clearer would it be better to combine the methods and results. For example, section 3.1 List the aim of the experiment, describe the experiment, discuss the results. I think this might make this paper easier to follow.

We think that having only one section instead of separated Methods and R&D would make sense for some sections but for many it would make things less clear and less readable. Therefore, we decided to keep the article in this format, since it also fulfills the AMT's guidelines for authors.

- Section 3.4 would be good to add a description of the other air used including any air chemistry you might have.

The air was obtained from our inhouse air compressor system and is classified to ISO 8573-1:2010. We have added the reference into the text in line 232. Other air was not tested.

- Line 372-Please note recent data with membranes and dual-channel systems have demonstrated that GOM is typically 25% in ambient air.

We have added a calculation for a higher GOM percentage and explained that the bias is dependent on the GEM:GOM ratio in the ambient sample: "The bias depends on the GEM:GOM ratio, the higher the percentage of GOM relative to GEM, the lower the bias will be. For example, a similar calculation as above but with 1.980 ng m^{-3} GEM and 0.02 ng m^{-3} GOM results in 456 % bias instead of 3500 %."

- Conclusions-It is important to note that most people do not now use the 1130/1135 unit on the Tekran system and papers with these data are not even being sent out for review.

I am struggling to find the connection between what you stated and our work. Additionally, there are still papers published in the literature that use data from

1130/1135 unit on the Tekran system. Examples: Slemr et al. 2020 (Atmospheric Chemistry and Physics), Wang et al. 2021 (Atmospheric Research), Mason et al. 2021 (Atmospheric Environment), Griggs et al. 2020 (Atmosphere).

- Figures 10 and 11 remove gridlines. You might consider putting figures like this in the Supplemental Information.

We have removed the gridlines as suggested.