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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Passive air sampling of gaseous elemental mercury: a critical review" *by* D. S. McLagan et al.

D. S. McLagan et al.

frank.wania@utoronto.ca

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We thanks the reviewer for the favourable and constructive comments. Below is a detailed response to each of the points raised.

REVIEWER: Switch the order of Section 2 (Basic elements of passive air sampling) and Section 3 (The rationale for a passive air sampler for gaseous elemental mercury). It seems more reasonable to first provide the rationale for passive air sampling of GEM in the beginning of the manuscript then followed by presenting the basic elements of passive air sampling, which is then followed by discussing the requirements of passive air samplers for GEM.

AUTHORS' RESPONSE: Although Section 2 introduces many important terms and

processes essential to GEM PASs, after re-reading section 3, none of the terms and processes referred to in the current section 2 are directly used in the current section 3. Considering the sentiment of Reviewer 2 it does therefore seem reasonable that we should introduce the rationale for the need for GEM PASs before describing their basic elements. As such in the revised manuscript we will switch these sections so that the rationale precedes the basic elements.

REVIEWER: The authors discussed potential problems with sorbents in existing samplers, such as passivation, memory effects, and physical degradation. However, in addition to those issues, how to assure that the adsorbed or absorbed GEM is not lost due to reactions with other constituents of the atmosphere, such as ozone and water vapor, because passive sampler is often used for longer sampling intervals (weeks or months)?

AUTHORS' RESPONSE: Passivation specifically is the term used to describe how adsorbed GEM is affected by other constituents in the atmosphere. To quote ourselves (Page 34625; Lines 4-7): "Passivation occurs when GEM binding sites on a sorbent become obscured by interfering compounds or when reactions between atmospheric constituents and sorbed Hg strip some of the analyte from the sorbent over time." As such, we believe that the manuscript already does address the issues the reviewer identified.

REVIEWER: This manuscript focuses on the discussion of passive air sampling of GEM, not on the review of existing devices, and thus the existing passive air samplers for GEM are only briefly presented and summarized in Section 5, Table 1 and Figure 2. This may be fine for those who are familiar with these devices. However, for those who are interested but do not have experience with these devices, it may not be easy to understand this information. Therefore, I would suggest the authors to expand Section 5 to include an introduction of existing PASs for GEM and the guidelines for the selection of proper PAS for various purposes.

AUTHORS' RESPONSE: We do not agree that section 5 is too brief and we believe that a more elaborate description of each sampler is likely to only confuse people more. While Section 5 is relatively brief, it is accompanied by Table 1 and Figure 2 in order to reduce the word count. Moreover, we refer back to individual designs in multiple instances through the remainder of the review (e.g., relating to their functionality), making a more extensive description of individual passive sampler designs a repetitive addition here. Finally, we feel the shortcomings of the existing passive samplers for mercury that we have identified, support neither a more extensive description of those samplers nor the development of guidelines for selection among them.

REVIEWER: The title of right-hand side y-axis should be Uptake Rate instead of Sampling Rate? According to the definitions in page 34610, it is the Uptake Rate that will change over time, not the Sampling Rate, right?

AUTHORS' RESPONSE: We assume this is in reference to Figure 1, not Figure 3. The right hand axis of Figure 1 is correctly labelled as 'Sampling Rate'. The sampling rate should remain constant, but only while the sampler is operating in the linear uptake phase. Once the sampler begins to approach the equilibrium uptake capacity and moves into the curve-linear phase, the sorbent is no longer working at its peak efficiency in "stripping" the air of Hg. For this reason it is greatly advantageous to only sample in the linear uptake phase or what we refer to as the effective deployment period.

At the request of another reviewer we have offered to update the second sentence in the caption of Figure 2: "Initially the SR is constant and the amount of sorbed analyte will increase linearly with time. During this phase the sampler can be described as being in the effective deployment period." This may help reduce any further confusion in this area. If this comment is indeed in relation to Figure 3, 'Sampling Rate' is again the correct axis title. This data was derived from literature values and shows the dependence of sampling rate on wind speed.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 34605, 2015.