Biogeosciences Discussions

Biogeosciences Discuss., referee comment RC2
https://doi.org/10.5194/bg-2022-124-RC2, 2022

Comment on bg-2022-124

Anonymous Referee #2

Referee comment on "Internal tree cycling and atmospheric archiving of mercury: examination with concentration and stable isotope analyses" by David S. McLagan et al., Biogeosciences Discuss., https://doi.org/10.5194/bg-2022-124-RC2, 2022

This manuscript aims to understand the Hg variations in tree-ring by isotopes, basically the data are interesting and could provide additional knowledge for us to understand the current challenge by using tree-ring to reconstruct the historical atmospheric Hg trends. However, the methodologies both in sampling and isotopic measurements in this study seem to not as the standard methodology in Hg dendrochemistry. In addition, the explanations for the variation of Hg isotopic signatures and Hg concentration seem to be not always convinced. I have several important issues that need to the authors to address before this manuscript can be accepted.

Abstract:
Basically, the abstract displays the variations of Hg concentration and MDF signatures. This is not enough, for Hg isotopic signatures, the odd-MIF is very important, while the authors did not depict this value any more. In addition, for the findings about the bark Hg sources and enriched in sapwood, the current evidences cannot support.
Introduction
The authors introduce a quite detail information about the vegetation uptake of atmospheric Hg0, and these introductions can help the researcher to follow the current processes of Hg research communities. Given manuscript aims to focus on the issue of internal tree cycling and atmospheric archiving of mercury, I would like to ask the authors to introduce more processes of Hg dendrochemistry, specifically the current challenge of Hg dendrochemistry to reconstruct historical atmospheric mercury (Hg) trends.
Methods.
I have several very important concerns for this section. I carefully read the sampling methodologies of this study, I found that the current description of the methodologies seems not meet our standards in the Hg dendrochemistry. In dendrochemistry, the tree-ring cross-dating is very important to check the absent or false rings in sampled tree ring cores. To guarantee the accuracy of tree-ring cross-dating, we usually sampled tree rings from more 25 tree stands, and dual radii tree-ring cores of south-facing and west- or east-facing sides of each tree were collected at ~1 m height. Then, 180- to 1500-grit sandpapers were utilized to polish one side of the tree ring until the ring boundaries and cells clearly visible. The tree-ring widths were measured. However, the authors without any cross-dating for their samples.
For the Hg analysis, how is blank for DMA80 boat, and how is the precision of your

methodology.
For the Hg isotopic analysis, the current description for the methodology is also not enough because of absent of QA/QC. Have you measured the CRM to assess if the non-unity recoveries resulting from the offline combustion-trapping technique induced discernible isotopic bias?
Results and discussion
The section of 3.2.
For Hg MDF in tree rings, currently few evidences can support the nearly no MDF occurring during the Hg translocation from leaf to stem. If the MDF occurring during Hg translation in vegetation, this leads to very hard to explain the variations of δ202Hg. This is because when the growth of tree, the canopy height increases quickly for the young tree periods. This means the Hg transport distance from the canopy to the 1-1,5 stem height sampled the tree rings increase with the tree growth year. For this study, authors subtracted -2.6‰ range of MDF caused by foliar uptake to reconstruct the δ202Hg signatures of air Hg0. Due to unknown the MDF occurring during Hg translocation in vegetation, this methodology seems not to be reasonable and convinced.
Section 3.3. 1
In this section, the authors highlighted that negative δ202Hg values which comparable to the tree-rings, and suggested that stomatal uptake, internal transport, and translocation from phloem to inner bark was likely the dominant uptake pathway for Hg stored in bark. Given substantial factors influencing the MDF occurring, the authors provided data cannot support their hypothesis. Given the loose porous structure of bark, the atmospheric Hg0 and Hg2+ absorption by bark also possibly leads to distinct MDF, which similar to the processes the Hg passing through the stomata and absorbed by the leaf tissues.