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Comment on **acp-2020-981**

Anonymous Referee #1

Referee comment on "Isotopic compositions of atmospheric total gaseous mercury in 10 Chinese cities and implications for land surface emissions" by Xuewu Fu et al., Atmos. Chem. Phys. Discuss., <https://doi.org/10.5194/acp-2020-981-RC1>, 2021

This manuscript described seasonal variations of Hg isotopes in TGM from 10 Chinese urban sites, and addressed the importance of urban surface emissions to both concentration and isotopic compositions of urban TGM. The provided concentration and isotopic data are precious for enhancing our understanding to the re-emission of Hg legacy in building surfaces or urban soils. The data was archived and presented well. In general, I recommend the publication of this article after the following revisions.

L110-112: To my knowledge, the effect of emission and re-emissions of GEM from urban surfaces was frequently neglected because we thought the flux was low in these processes, but not the poor understanding of isotopic signatures of that.

L112-115: If we accept anthropogenic emissions as the most important component to urban GEM, which has been proved by many speciation observations in China, the observed $d_{202}\text{Hg}$ in TGM should be linked with that in local coal rather than an averaged value from publications. According to Liu et al. Chemical Geology, 2019, $d_{202}\text{Hg}$ in stack emission was similar with feed coal used in CFPPs.

L213: Did the authors present ^{204}Hg data in this study?

L359-367: It's a little arbitrary to evaluate the contribution from urban surface using averaged values from only 3 studies of various surface emissions. The authors should emphasize that.

L414-416: These study sites are all located in monsoon area in China. How about the effect from monsoon climate? Cities in east part of China, especially in north China plain, are largely controlled by north wind from Siberian in winter. The continental monsoon originates from low human active areas, with low GEM concentration, high $d_{202}\text{Hg}$, and low $D_{199}\text{Hg}$ in air parcels. This could also be indicated from Figure 4 in this manuscript. I suggest the influences from monsoon be discussed in this study.