Atmospheric Chemistry and Physics Discussions

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Comment on acp-2022-750

Yanxu Zhang (Referee)

Referee comment on "Unexpectedly high concentrations of atmospheric mercury species in Lhasa, the largest city in the Tibetan Plateau" by Huiming Lin et al., Atmos. Chem. Phys. Discuss., https://doi.org/10.5194/acp-2022-750-RC1, 2022

General comments:

This paper presents continuous observations of different atmospheric mercury species in Lhasa, the largest city on the Tibetan plateau. Atmospheric mercury was analyzed for different periods (Indian Summer Monsoon and Westerly Circulation) and further studied the daily variation of atmospheric mercury concentration as well as some typical high-value cases. The results indicate that the atmospheric mercury concentration in Lhasa is significantly higher than that in the adjacent region, reflecting the influence of local anthropogenic emissions and wind fields on the atmospheric mercury concentration in remote areas. Overall, this manuscript is clear written and makes up for the lack of observations of atmospheric mercury at high altitudes. The paper can be accepted after addressing the following comments.

Specific comments:

- Lines 91-92, “whether the Tibetan Plateau can be treated as a background area for studying atmospheric Hg”. It’s an interesting question, and what do you think about it after you've made several observations of atmospheric Hg (such as Lhasa, QNNP, SET, and Namco) on the Tibetan Plateau?
- Line 100, please add a reference for the average GEM concentrations in the Northern Hemisphere.
- Lines 110-111, “the wet deposition of total Hg and particulate Hgwas higher during the non-monsoon period than during the monsoon period”. The wet deposition is correlated with the precipitation, but why is Hg wet deposition lower during the monsoon than during the non-monsoon?

- L116, “continuous”
- L195, “categorized”
- 1, please add mark (°N, °E) to the latitude and longitude of the coordinate axis. Same for Fig. 5.
- Lines 217-219, GEM concentrations are nearly twice as high in September as in February, contrary to previous studies (e.g., Horowitz et al. 2017; Jiskra et al., 2018) that atmospheric mercury in the Northern Hemisphere is low in summer and higher in winter. Please try to explain the reason.
- Line 237, please give the definition of WEC1 and WEC2 in the paper.
- Lines 242-243, “the GEM concentration in Lhasa is low among the provincial capitals in China.” is inconsistent with “The atmospheric Hg species concentrations were higher than ... other provincial capitals in China.” in Lines 33-34.
- 2, what is the reason for the sparse observations in 2016/12?
- 3, please add the meaning of the dotted lines and the units of different observations.
- Section 3.2, it will be more intuitive to add a correlation analysis between Hg and other pollutant species? In addition, ozone, aerosols, and NO2 are thought to be related to Hg chemistry, and their relationship in plateau would be meaningful to the study of Hg.
- 4a, please add units of the pollutants.
- Line 413, what are the “four components”?
- Table 4 note, please correct “> 0:5” & “<0:1”.
- Lines 465-466, “The GEM concentration WEC2 in Lhasa is 0.16 ng m-3, higher than 1.31 in QNNP?” And the “1:31 ± 0:42 ng m-3”. Please correct.

References

Horowitz, H. M., Jacob, D. J., Zhang, Y., Dibble, T. S., Slemr, F., Amos, H. M., Schmidt, J. A., Corbitt, E. S., Marais, E. A., and Sunderland, E. M.: A new mechanism for atmospheric mercury redox chemistry: implications for the global mercury budget, Atmos. Chem. Phys., 17, 6353-6371, 10.5194/acp-17-6353-2017, 2017.

Jiskra, M., Sonke, J. E., Obrist, D., Bieser, J., Ebinghaus, R., Myhre, C. L., Pfaffhuber, K. A., Wängberg, I., Kyllönen, K., Worthy, D., Martin, L. G., Labuschagne, C., Mkololo, T., Ramonet, M., Magand, O., and Dommergue, A.: A vegetation control on seasonal variations in global atmospheric mercury concentrations, Nat. Geosci., 11, 244-250, 10.1038/s41561-018-0078-8, 2018.