

Interactive comment on “Atmospheric total gaseous mercury (TGM) concentrations and wet and dry deposition of mercury at a high-altitude mountain peak in south China” by X. W. Fu et al.

Anonymous Referee #1

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China probably concentrates the largest anthropogenic sources of atmospheric mercury in the world. There is still, however, a clear lack of data about direct measurements of atmospheric mercury in China. Only few studies have been published so far, and the manuscript published in ACPD by Fu and others describes a valuable data set (i.e., 1-year long monitoring of GEM). The discussion about seasonal and diurnal patterns of atmospheric GEM is interesting, and good efforts are done to compare the data from others sites, both in China or USA/Europe.

However, there is confusion in the manuscript between TGM and GEM, and deposition fluxes seem uncertain due to limited sampling of throughfall deposition and direct wet

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deposition. I would recommend that the authors discuss better the limitation of their data set. I am not sure it really makes sense to scale up these fluxes to China (page 23479 line 23).

TGM or GEM sampling:

The authors report TGM concentrations. TGM would include GEM as well as reactive gaseous mercury (RGM). However, atmospheric mercury was sampled using a 8-m long unheated line. I would guess the authors only measured GEM, as Tekran recommends using a heated line (+50degC) to collect GEM and RGM (i.e., TGM). This should be clarified in the whole manuscript. I report few examples below, but they are more in the manuscript:

Page 23470 line 13-15: GEM and not TGM

Page 23477 lines 21-23: the authors mention that TGM does not influence much wet deposition and throughfall compared to PHg and RGM. But TGM includes RGM ! This discussion would make more sense if the authors actually discussed GEM and not TGM in their manuscript.

Page 23486 line 24: "TGM is not the immediate factor influencing wet deposition". GEM is poorly related to wet deposition. We can not conclude about TGM.

Page 23487 lines 2-3: confusion between TGM, GEM, and RGM

Most of the time, the discussion comparing atmospheric GEM to wet deposition is unclear in the manuscript. The author assume they measured TGM (i.e., GEM +RGM), and they try to relate this signal to wet deposition. Eventually, the authors could hypothesize about atmospheric RGM and HgP from their wet deposition levels, independently of atmospheric GEM.

Wet deposition:

Mt Leilong seems to be located in a high precip area (section 2.1). However, in this

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study, only 32 precip event were collected (1/week + missing weeks + dry weeks). I wonder how representative these samples are. How long was a precip event? Do the authors really consider they can extrapolate annual wet deposition flux from 32 rain events?

Page 23481, line 14: the correlation between precip depth and wet deposition is surprising. It means that Total Hg concentrations were larger when collected during longer precip events. People usually found that the shorter the precip event is, the higher the THg concentration is (e.g., Landis, M., A. Vette et G. Keeler: Atmospheric mercury in the Lake Michigan basin: Influence of the Chicago/Gary urban area, Environ. Sci. Technol., 36, (21), 4508-4517, 2002). This correlation reveals issues: if wet deposition flux significantly increases with precip depth, it means that different flux values could be inferred from different precip events. However, the authors only collected 1 event/week, and used these values to calculate monthly/yearly wet and dry deposition fluxes. I do not expect all rain events during a 1-week period to show the same precip depth. More discussion would be required to explain this relationship.

Dry deposition:

Hg dry deposition in this manuscript is calculated as: $\text{dry deposition} = \text{litterfall} + \text{throughfall} - \text{wet deposition}$. Thus, the limited sampling of throughfall and wet deposition will bring uncertainties in dry deposition calculation. For example, precip were lacking during multi-weeks period during this study (total : 19 weeks). I would expect throughfall to be higher after a multi-weeks period without precipitation. That may partially explain the large range shown in Fig. 4 for the difference between throughfall and precipitation.

Specific comments:

The running head title “Atmospheric total gaseous mercury (TGM) concentrations” is not specific to the study (moreover, the authors likely measured GEM instead of TGM).

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Page 23467 line 14: typo “TPM” (should be “PHg”)

Page 23468 line 15: typo, no capital letter for “knowledge”

Page 23468 line 20: typo, remove “China”

Page 23469 lines 12 and 22: I guess the authors refer here to figure 1, and not figure 2

Section 2.3: why backtrajectories ended 500 m above ground?

Page 23480 line 28: “Emission of Hg from litter is lower compared to soil”, please clarify.

Page 23486 line 6: I am not sure a 1-year monitoring of GEM in central China is enough to conclude about global importance of Chinese Hg emissions.

Page 23486 line 10: What does “seasonal changes in scavenging processes” means? Changes in precip amount?

Figure 1: there is no scale for the inserted emission map.

Figure4: typo, “throughall”

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