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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Observation and analysis of speciated atmospheric mercury in Shangri-la, Tibetan Plateau, China" *by* H. Zhang et al.

Anonymous Referee #2

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The manuscript entitled "Observation and analysis of speciated atmospheric mercury in Shangri-la, Tibetan Plateau, China" details the atmospheric mercury concentrations at a site in south-central China. This site is part of the Global Mercury Observation System (GMOS) and reporting of the data is potentially important. Unfortunately the paper does little to advance our understanding of atmospheric mercury cycling or atmospheric chemistry and physics in general. The results are not surprising, could have been arrived at by some quick HYSPLIT back-trajectories, and are not at a level that should be reported in a journal with a high impact factor like AC&P. Also several statements are not backed up by data or even a clear explanation. For example, the authors suggest that a diurnal pattern of GOM could possibly be caused by oxidation of Hg0 with stronger solar radiation. However, the authors suggest no mechanism or offer any

measurements to substantiate this statement. This oxidation typically occurs in the Arctic, at coastal sites, or areas with high atmospheric halogen concentrations. As far as I can tell this site is none of these. Also in the conclusions the authors state “The TGM concentration was higher during the daytime mainly due to the diurnal surface temperature shift” but there is no data to support this.

General Comments

The manuscript is need of a serious proofread and editing, which I have not done.

Specific comments

-Pg 11045 Line 10: “< 10 g km-2 of Hg annually” needs a citation

-Pg 11046 Line 3 – 19: Were the measurements conducted with a Tekran speciation unit? If not then there needs to be significantly more information provided. What denuders from what company were used? What filters (part number) from what company were used for PBM? Were there separate sampling streams for GOM and PBM? Were samples collected manually then desorbed later? If so were multiple denuders used? This can introduce bias and data on the variability between the denuders needs to be provided. Was the same 2537A used to analyze the PBM and GOM and GEM? If so there should be gaps in the data, and if not there is some error that needs to be discussed. Has this system been used for other studies? If not then a diagram of the instrument set up is required. Also the dates when GOM and PBM were measured needs explicitly stated.

-Pg 11049 Line 12: “level” should be “levels”

-Pg 11049 Line 19: “TGM mean concentration at the SAWRS was slightly higher” this is HUGE understatement. Nearly twice as high is not “slightly higher” and should not be called a “background” site in any way. If it must be called a “background” site then it should be referred to as a “Chinese background” site because the concentrations are much too high to be considered a global background site.

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-Pg 11050 Line 1: “possibly the weak local” should be “possibly weak local”

-Pg 11050 Line 3: “prevailing westerly,” should be “prevailing westerly wind,”

-Pg 11050 Line 4: “measured at in Korea” should be “measured in Korea”

-Pg 11050 Line 6: How is 2.04 ng m-3 at Cape Hedo a higher concentration than the 2.55 ng m-3 mean measured at SAWRS?

-Pg 11050 Lines 11 – 14: Higher TGM levels with northerly winds and elevated TGM associated with southerly winds? Is there something missing here? Are winds from the north and south both high in TGM? If so what is the range in concentrations for the southerly winds?

-Pg 11050 Lines 11 – 12: “. . .northerly winds that carried domestic emissions from West China. . .” Were there any tracers measured to provide proof that these were domestic emissions from this area? I need more convincing here, the evidence is not definitive and needs support.

-Pg 11050 Lines 16 – 17: “low TGM concentrations.” What is meant by this? What is the range or mean?

-Pg 11050 Line 18 – 19: “The air mass in the east-west direction. . .” What mountains did the air mass need to cross in each direction? What are the elevations compared to the measurement site? Distance from site? Is the site in a valley? This should be described better in the methods section. . .

-Pg 11051 Line 3 – 4: “Another possibility is the oxidation of Hg0 caused by stronger solar radiation.” What mechanism is being suggested here? This typically occurs in the Arctic, at coastal sites, or sites with high atmospheric halogen concentrations, but I do not think this site falls into these categories, so is there evidence to back up this statement?

-Pg 11051 Line 11: What does the term “generally” mean? Were they statistically

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significantly lower? If so what are the statistics?

-Pg 11051 Line 12 – 13: “associated with high WS, from [the] Tibetan Plateau caused the lower observed TGM.” How did these air masses “cause” lower TGM? Fewer sources? More forests? What proof is there?

-Pg 11051 Line 13 – 14: “The TGM level was highest in spring. . .” Is this statistically significant? If so what is the p value? N?

-Pg 11051 Line 17 – 18: “Elevated TGM” What does this mean? Are the concentrations above the mean? Above 2.5 ng m-3?

-Pg 11051 Line 22: What is a “general negative correlation”? Is it a statistically significant correlation? If so what are the r and p values?

-Pg 11051 Line 25 – 26: “enhanced Hg uptake by vegetation. . .” What vegetation surrounds the site? What is the process by which this occurs?

-Pg 11051 Line 26 – 27: “. . .which has been observed several earlier study in Chang-Bai Mountain and in the Northeast US. . .” should be “. . .which has been observed by two earlier studies in the Chang-Bai Mountains in China and the Rocky Mountains in the US. . .” If the authors are making this statement, significant discussion is needed. The site in the US was a very high elevation site, far above treeline and quite there was quite a bit of discussion. Please put this study into perspective with those studies and tell us in detail why this may be a vegetation effect.

-Pg 11051 Line 28: “winter months were” should be “winter months was”

-Pg 11052 Line 2: What does “not substantial” mean? What was the mean, range, and standard deviation?

-Pg 11052 Line 4 – 6: What does “substantial seasonal variability” mean? Are there significant differences? If so what are the p values?

-Pg 11052 Line6: “5 times of the” should be “five times the”

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-Pg 11052 Line 6: ". Similar pattern. . ." should be "A similar pattern. . ."

-Pg 11052 Line 10: "were high in autumn and winter. . ." what does "high" mean? How high? Compared to what?

-Pg 11052 Line 14: "Trajectories analysis" should be "Back-trajectory analysis"

-Pg 11052 Line 15 – 16: "air mass from Burma, Vietnam, Laos, Kampuchea and Thailand, likely of biomass burning origins." Is there any data to back up this statement? Other atmospheric tracers? Information on forest fires or biomass burning of any kind?

-Pg 11053 Line 1: "three high Hg events". Why are two highlighted in red and one in blue?

-Pg 11053 line 11: "Figure 1" There are no back-trajectories on Figure 1.

-Pg 11053 Line 13 – 14: "The elevated concentration in this event was likely to be contributed by the domestic emissions." How do you know this?

-Pg 11055 Line 5: Northern Hemispheric background is 1.5 – 1.7 ng m-3 not 1.5 – 2.0 ng m-3.

-Pg 11055 Line 10: "level" should be "levels"

-Pg 11055 Line 11 – 12: "The TGM concentration was higher during the daytime mainly due to the diurnal surface temperature shift." This was not proven in the manuscript. Thorough discussion needed. Is this referring to the cold air drainage off of the mountains? If so are there any measurements of boundary layer height? Balloon launches? Modeling?

-Pg 11055 Line 13 – 14: "and the in situ photochemical productions of might have contributed to the occasional high GOM concentrations." First, this should be "and in situ photochemical production might contributed to occasionally high GOM concentration." And second, this is not supported by any data and therefore cannot be a main finding of the paper.

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Table 1. Some indication of the number of samples should be given.

Fig. 1. The countries should be delineated and labeled.

Fig. 2. Five-min mean implies that many samples were taken and a mean was taken. Is this correct? If not then “Five-min mean” should be “Five-min samples”.

Fig 3. “roses” should be “rose”

Fig 4. Second and third sentences are results and should not be in the figure legend.

Fig 5. Not sure what the second sentence in the legend is saying and third sentence is a result and should not be there.

Fig 6. Sentence two and three are results.

Fig 7. What do the boxes indicate and why are they different colors?

Fig 8 and 9 legends have results that should not be there.

Fig 10 is not referenced in the text.

Fig. 11 should be more clearly described in the text and only the information needed to interpret the figure given in the legend. As it is it makes no sense.

Fig. 10 to 14 could be deleted.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 11041, 2014.