

Interactive comment on “Worldwide atmospheric mercury measurements: a review and synthesis of spatial and temporal trends” by F. Sprovieri et al.

Anonymous Referee #3

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Journal: ACP Title: Worldwide atmospheric mercury measurements: a review and synthesis of spatial and temporal trends Author(s): F. Sprovieri et al. MS No.: acp-2009-849 Special Issue: Atmospheric mercury (ICMGP2009)

General Comments This manuscript presents an overview of worldwide mercury observations with regard to spatial and temporal trends. Attention is given to the scope of observation networks and collaborative studies and some trends and patterns among and between the different observations. The authors highlight the number of important observations that have been in many locations and the value that could be realized by having more extensive records in both time and space.

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Since this is a review paper, it has different criteria to meet. In particular, it should present a thorough review of the literature and make clear, concise summaries in a logical framework. I found several sections to have poor structure or a vague summary/synopsis or both. There are also several places where the references are inadequate or incorrect, or the discussion is not sufficiently thorough. On a smaller scale, there are many long sections that need to be divided into smaller paragraphs, with more use of topic paragraphs and topic sentences. I have also noted many places where the grammar needs to be fixed or improved.

I find the topic to be appropriate for ACP and the article to be useful, but I think there needs to be substantial revision.

Specific and technical comments 1262, 14–16, Beginning with “The world’s ...”: This sentence is a run-on. Please rewrite.

1264,6 “Recent studies...” this should start a new paragraph.

1264, 20 “General scientific consensus...” This sentence doesn’t fit with the previous paragraph and doesn’t introduce or transition to the next topic. It is also has the only values provided in the introduction although many other components of the cycle are discussed which have important values, too. But what’s the point of putting them here? Why not mention other values, emission rates, fractions, deposition rate, speciation?

1264, 26 “Like atmospheric Hg...” this should start a new paragraph.

1264, end and 1265, beginning: Here, the issue of monitoring networks is introduced, and then immediately dropped. But, you return to them again at the top of 1266.

1265, 13: “Slemr et al. (2003)...”, 21: “... Lindberg et al., (2007)...” you begin to discuss the results of two particular studies with regard to trends (which is the point of this paper). Why only mention these two papers at this point? It is not clear that they present any special data or conclusions. Then, the topic moves to a different approach (interstitial snowpack air) and deposition. What is the point?

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1266, 1 This paragraph and page begins with a sentence discussing TGM in the Southern Hemisphere. But, the next sentence jumps to efforts to expand monitoring networks in North America. And the next sentence is a description of the purpose of the manuscript. And the following sentences discuss shipboard measurements. This is incoherent. What is the point of this paragraph?

1266, 23: "...1970..." should be "...1970s". And, you say that "... data are available for both hemispheres." I was not aware that there was any southern hemisphere data from the 1970s. Since this is a review article, the author should include references to representative publications, or other publications which review the data.

1268, 24, "The project 'Mercury ...'" this should begin a new paragraph on the MOE project. 1269, 18, "A comparison of ..." this should start a new paragraph. 1269, 20, "...have ..." should be "... has..." 1270, 2, "... (MBL) lead ..." should be "... (MBL) led..." 1270, 3, "... would lead ..." should be "... would have led..."

1270, 7 "High HgII..." the topic has switched to HgII, but then goes to Hg exchange between the atmosphere and surface water. This doesn't fit and needs to be reorganized. At a minimum, air-sea exchange should be a new paragraph, perhaps a new section heading. But, the very next section is "Over water Hg measurements and air/water exchange". This information should be moved to the next section.

1271, 20 to 1272,4: on 1271,20 starting with "The transformations of ..." This is an introduction to aquatic mercury, which should be in the introduction paragraph of "2.3 Over water Hg ..."

1271, 24 "The major components ..." This statement ignores methyl mercury (MeHg). While MeHg concentrations are usually quite low compared to Hg-tot, they are obviously of much greater importance because of their toxicity and bioaccumulation. The author needs to at least mention methyl mercury, and explain/justify why it is not discussed further.

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1272, 2: Why cite Schroeder and Munthe, (1998) here? Schroeder and Munthe (1998) is a review of the entire mercury cycle and doesn't focus on over oceans, air-sea exchange, or the Mediterranean.

1272, 2-4: "The efficiency of the evasion ..." This statement needs references.

1272, 14-18: "Mason et al. (1994a)..." and the Mason and Sheu (2002) are referring to global budgets and so are out of place in this section. Please delete these sentences. You do use values from the studies in the next page, which is fine. But, the sentence in 1273, 8 "Considering the estimations..." is all that is needed.

1275, 22: "... were higher UV radiations ..." should be "... was higher UV radiation..."

1277,26 – 1277,1: Starting with "Fluxes were calculated..." Kuss and Schneider (2007) used the flux model of Weiss et al. (2007) (see full reference below), not Weiss-Penzias et al. (2007) as stated. Weiss, A.; Kuss, J.; Peters, G.; Schneider, B. Evaluating transfer velocity–wind speed relationship using a long-term series of direct eddy correlation CO2 flux measurements. J. Mar. Syst. 2007, 66 (Special Issue), 130–139.

1279, 2: "... seem not be ..." should be "... seems not to be ..." 1279, 3: "... it was observed..." makes this sentence ungrammatical. Replace with something like "... there were ..."

1280. There are many more studies from South America, why were only these two studies discussed? A review article should be more thorough. Or, the studies should be mentioned and a clear justification given as to why they are not discussed. For starters, in a quick search I found:

Garcia-Sanchez, A., F. Contreras, M. Adams, and F. Santos. 2006. Airborne total gaseous mercury and exposure in a Venezuelan mining area. IJEHR, 16(5):361 – 373. Hacon S., Artaxo P, Gerab F, Et Al. (1995) Atmospheric Mercury And Trace-Elements In The Region Of Alta Floresta In The Amazon Basin, WATER AIR AND SOIL POLLUTION, 80, Issue: 1-4, 273-283.

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Almeida MD, Marins RV, Paraquetti HHM, et al. (2009) Mercury degassing from forested and open field soils in Rondonia, Western Amazon, Brazil, CHEMOSPHERE, 77(1), 60-66.

Also, Mexico is obviously not in South America, so why is Mexico being discussed in this section? While the monitoring history in Mexico is not comparable to that in the US or Canada, it doesn't make any sense to include it with South America. Either move the Mexico discussion to the North America section or retitle/restructure these sections.

1280, 7: "TGM concentrations observed in urban and rural areas were up to 10 ng m⁻³ ..." But, you go on to say that at Zacatecas mean concentrations were very high at 71.7 ng m⁻³. These two sentences are inconsistent. So, Zacatecas is neither urban, nor rural, nor adjacent to a mining area, then what is it and why does it deserved to be mentioned? The section is lacking clear structure and should be rewritten.

1280, 8: "...whereas Adjacent ..." should be "... whereas adjacent ..."

1280, 12: "At two rural sites ..." Where, in Mexico or South America? Since the previous sentence was referring to Mexico, I'd assume you are referring to Mexico. If so, two sites in Mexico can not be used to characterize rural concentrations in all of South America. This should be deleted or, preferably, the entire section should be rewritten.

1281, 14, 16, 22 "... ngm⁻³ ppbv ..." should be "... ngm⁻³ /ppbv ..." or "... ngm⁻³ ppbv -1 ..."

1281, 24: "However, recent Chinese ..." The topic has now drifted into emissions inventories. This topic doesn't fit in this section.

1281, 26 "Fain ..." . The topic has switched to atmospheric oxidation processes and so a new paragraph should be started.

Also, the first reports of high HgII at high altitude were by Landis et al., (2005) in Mauna Loa, HI. And, Swartzendruber et al., (2006) were the first to analyze high HgII at high

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altitude (Mt Bachelor, OR) and show that it was due to atmospheric oxidation and not related to pollution. Both of these papers are already in your bibliography and so you should cite them accordingly, here. Or, you need to justify why you don't want to include or discuss them. Also, you would do well to point out that these three studies found very similar observations all the way from Hawaii to Oregon and Colorado.

1282, 4: "... reduction, ..." you mean oxidation.

1282, 7 : "Most air quality ..." This sentence and following are a summary or overview of this section. This section is lacking in structure and should be rewritten. I suggest taking most of the content from 1282,7 to the end, and using this as a start, then list the high altitude sites (like you've done at the end of 2.6) and then organize it around the two or three major scientific issues that these sites/platforms have made a contribution. I.e. studying where transport occurs in the atmosphere, looking at TGM/CO ratios, and atmospheric oxidation studies.

1282, 10-12: "Studies have shown ..." This needs references.

1282, 17: "... Swartzendruber et al., 2006)..." This paper is on Mt. Bachelor and doesn't cover any aircraft research. Do you perhaps mean Swartzendruber et al., 2008, J. Geophys. Res., 113, D10305, doi: 10.1029/2007JD009579?

1282, 18: "... of aircraft ahs ..." should be "... of aircraft has ..." 1282, 22: "... Mt. Batchelor ..." should be "... Mt. Bachelor"

1282, 23: "... (Jaffe et al., 2003)." This paper doesn't discuss Mt Bachelor. Perhaps you are thinking of Weiss-Penzias et al., 2007, which is already in your bibliography.

1283, 11: "Nguyen et al., " This sentence is very awkward and unclear. Please split it and improve its readability.

1283, 26: "Hg-species..." " This sentence is a run-on and is awkward. Please split it and improve its readability.

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1283, 28: I don't any discussion of the Jaffe et al., (2005) observations of Hg at the Cape Hedo station, which would be appropriate, and the reference is already in your bibliography. This would be a good place to mention these observations and their role in highlight the discrepancy in the emissions inventories. Also, they should be included in Table 6.

1283, 29: "Monthly mean concentrations ..." These data need citation(s).

1284, "2.8.1 Monitoring network and trends". There is only one station, the GAW, correct? If so, this does not constitute a network, as the section title states.

1284, 8: "... the first data obtained until June 1999." This is awkward and the meaning is not clear. Please reword.

1284, 18: "The Cape Point ..." This statement needs a reference, or is it the author's conclusion?

1285, 15-20. "During the 3-month ..." This sentence is a run-on and is hard to understand. It could easily be broken up into 2 or 3 sentences. I suggest starting with something like: "First identified at Alert in the Canadian High Arctic (Schroeder et al., 1998), AMDEs occur during the 3-month period following polar sunrise." Then, summarize what happens in the AMDEs.

1287, 20: "... the production and ..." the remainder of this sentence has multiple errors and needs to be rewritten. 1288, 14: "... same goal is all ..." I think you mean: "... same goal is always..." 1288, 24: "... it will possible " should be "... it will be possible..." 1289, 2-9: "The need, therefore ..." This sentence is a run-on and the meaning is not clear. It should be broken up into 2 or 3 sentences.

Table 1. There are too many significant figures for all of the RGM and TPM data. At the absolute most there are two significant figures (or perhaps three for some of the larger values) but certainly reporting to 0.01 pg m⁻³ is unnecessary and adds visual clutter.

Table 5. Why aren't the Fain et al. (2009b) data or the Landis et al. (2005) data listed

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here? Fain et al., (2009b) is North America. Along with the Mt. Bachelor data, they could all be described as "Remote Sites", or High Altitude or Free Tropospheric.

Table 6. Probably should include data from Jaffe et al., (2005) from the Cape Hedo station to be consistent with 1283, 28.

Figure 1. This map does not include any sites from North America. Please change the title or add a figure (in Fig 1 or a new figure) that has sites from North America.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 1261, 2010.