

## ***Interactive comment on “Projections of atmospheric mercury levels and their effect on air quality in the United States” by H. Lei et al.***

### **Anonymous Referee #2**

Received and published: 11 September 2013

Overall I think that this is a good paper, well thought out, well written and merits publication with minor revisions. This type of research is important for the analysis of impacts of both changes in anthropogenic activities and potential climate changes.

Scientific comments: 1. Page 3 line 54 – have the HTAP and UNEP reports not touched on this topic we well? 2. Page 4 line 81 – was this not also addressed in the AMAP Hg assessment? If so, add that to the references 3. Page 6 line 124 – why is bromine not included as an oxidant of Hg? Is this not in the model? If not, please state why. 4. Page 6 line 133 – please describe the various IPCC scenarios. Many readers do not know the details of each scenario. Either in the text or in a table. 5. Page 7 line 153 – This section is entitled “Anthropogenic Emissions” but you are mostly discussing coal burning and not other inputs or regulation so I suggest that you change the title to

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more accurately reflect the discussion 6. Figure 1 – is the projection of Hg(II) really so high in comparison to Hg(0)? The concentrations are so much smaller for Hg(II) in the atmosphere that I can't see how, in North America, these number are possible. Maybe a statement about that is required. 7. Page 8 line 182 – please reference the relative percents of different species emitted 8. Page 9 line 212 – In regards to no future changes considered as a result of volcanoes, there may not be any primary changes from historical background but what about secondary effects such as changes in transport patterns? Also, is this number from Hg(0) emissions of PHg? 9. Page 10 line 227 – for what region is this land mercury storage mass, please specify? 10. Section 3.3 – So what are the results? This section only discusses how it was done but not the results of the analysis. What are the projections for land and soil emissions? 11. Page 12 line 272 – you introduce TGM here but do not say what it is, please define using the terms you have been using within the text. 12. Page 13 line 285 – have you looked at the 1995-2000 emissions, run the model and compared with actual measurements? There are many sources of this kind of data available especially for GEM/TGM. 13. Page 13 line 293 – 4.7 is a very high increase for TGM/GEM and considering levels are decreasing in the Northern hemisphere. Do you want to comment on how realistic this is? 14. Figure 5 – hard to read the numbers on the plots 15. Figure 6 – I would like to see the data presented as % change rather than concentration because its hard for the reader to tell the impact of the concentration changes. 16. Page 16 line 351 – please reference the acceleration of Hg(0) oxidation from temperature 17. Page 17 lines 384-386 – do you have any estimate of uncertainty? You have 2 decimal places for GEM and 1 for the others, can you please discuss this briefly. 18. Page 18 line 411 – define high latitudes 19. Page 18 lines 411-419 – you use the word relatively but that is not scientific, please use other words or use numbers to be less vague and more precise 20. Page 19 line 421 – and what about PHg? 21. Table 2 – are the deltaHg numbers statistically significant? Please add in some discussion about that. 22. Table 2 - Its very odd to me that PHg would decrease in increasing anthropogenic – climate scenarios. Maybe a few sentences about that is warranted in the discussion

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Editorial comments: 1. Page 2 line 49 – maybe update the UNEP report with the currently available 2013 report. 2. Page 6 line 140 – do you mean archived or achieved? 3. Page 10 line 226 – net accumulation not net accumulations 4. Page 17 lines 378-379 – I don't understand this sentence, please rephrase 5. Page 18 line 399 – deposition not depositions 6. Page 18 line 401 – findings not finding

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Interactive comment on Atmos. Chem. Phys. Discuss., 13, 20165, 2013.

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