

## ***Interactive comment on “Estimation of speciated and total mercury dry deposition at monitoring locations in Eastern and Central North America” by L. Zhang et al.***

**Anonymous Referee #3**

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### General Comments

This manuscript details model estimates of annual GEM, GOM, and PBM dry deposition to several sites in Eastern and Central North America. Although this model is currently regionally specific I believe this to be a very important progression in modeling mercury deposition. By using measured concentrations of speciated mercury, I believe this is an important use of an established network of atmospheric measurements. I do believe, however, that the authors should be careful calling this model more “realistic” than other models. The Tekrans used to measure speciated mercury measure an “operationally defined” GOM and PBM quantity, therefore it is not actually

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known what “realistic” is. As other more global mercury monitoring networks come online, tools like this model will be extremely important. After a few minor revisions, I support publication of this manuscript.

### Specific Comments

1) There are several typos. I will mention the ones I found in the technical suggestions, but this manuscript could benefit from an outside proofread. There are also several areas where the qualitative discussion could benefit from some quantitative discussion/details. More specifics follow.

2) The entire manuscript could benefit from some greater explanation of variation and trends. More in-depth discussion of the model predictions at individual sites, or geographically similar sites would be very helpful. For instance, P. 2794 lines 1 – 13 provide only a cursory look at the GEM concentrations, mentioning “two other urban sites”. I feel more discussion is needed here. Other areas that need more in depth discussion of regional or site by site variation, and what may be driving that variation are page 2795 lines 25 – 30. Terms like “generally” should also be avoided (i.e. page 2796 line 1) and more specifics should be given.

3) P. 2793 line 24 to 2794 line 13 – This entire paragraph needs to be more quantitative. The qualitative descriptions are good, but should be backed up with some data. “Seasonal variation of GOM and PBM were highly variable...” What is meant here? What does highly variable mean? What were the ranges? Was there also some diurnal variation? P. 2794 – line 4 – What does “GOM concentrations in spring were much higher than in any other season” mean? 10 times higher? 50 times? And so on for that paragraph...

4) P. 2794 line 15 to 18. A brief description of why the Vd values vary based on these conditions would be helpful.

5) P. 2795 line 3 – GEM, Vd was higher during seasons with larger LAI. This is redun-

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dant with the earlier paragraph and still does not explain why.

6) P. 2795 line 12 – 28. The annual total GEM deposition numbers are high. How do these estimates compare to other model/measurement estimates. Others have done estimates without doing re-emission estimates, so how do these compare and why are they so high?

7) P. 2797 Line 11 (and line 22). As mentioned earlier, I believe that this statement may be a little misleading. Large scale atmospheric transport models are typically based on known chemical kinetics and known chemical constituents. However, measurements made by Tekran analyzers are operationally defined and it is not known exactly what they are measuring therefore, the statement that estimates made from AMNet data are more “realistic” is entirely misleading.

8) Section 3.4 “uncertainties” should be placed at the end of section 3. It seems to really break up the progression of the discussion.

9) P. 2802 line 24 – 25. A summary or suggestion of what specifically drives the “relative contribution” differences would be nice here.

Technical Suggestions:

I suggest the authors give the manuscript a significant editing. Possibly having an outside person read the document. Here are my suggestions but there may be more needed: 1) P. 2785 line 6. Concentration should “concentrations”.

2) - line 9 . “different Vd values.” Should be “different modeled Vd values.”

3) - line 21. “important as wet deposition” should be “important than wet deposition”

4) P 2786 line 11 – 24. This paragraph needs re-written. The word uncertainties is used at least 5 times. Makes for difficult reading.

5) P 2787 line 2. Estimation should be “estimations”

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6) P 2792 line 10. “litetrfall” should be “litterfall”.

7) P 2794 line 12. “factors include” should be “factors including”

8) - line 15. “simialr” should be “similar”

9) P 2797 line 7. “suggested similar” should be “suggested a similar”

10) P 2798 line 1 – 2. “they agreed by an average of 4.9%”. What does this mean? Within an average? Confusing.

11) – line 7. “sampler design” should “sampler designs”

12) P. 2799 line 8. “collected by Tekran” should be “collected by a Tekran”

13) – line 12. “need to be” should be “needs to be”

14) P. 2800 line 10. “conifers” should be “coniferous”

15) – line 22. “litterfall Hg were in” should “litterfall Hg was in”

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