

Interactive comment on “Mercury transformation and speciation in flue gases from anthropogenic emission sources: a critical review” by L. Zhang et al.

Anonymous Referee #2

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Overall, the paper is very well written and in very good shape to publish. All I would offer is some small points here and there, and points mostly for clarity for the reader. I am not an engineer or a modeler, but a mercury scientist, so it is read it more as a “general mercury reader”.

1. Section 2.2.4 seems a bit out of place. You are going through the figure and the APCD's, and this section focuses on industrial boilers, where the sections before and the section after is for CF power plants. Consider making this one last of Section 2.2.X.
2. Section 2.2.5 isn't in the figure. Perhaps it is not appropriately put there? I was just expecting it to be there.
3. Page 32899, line 13; bonds instead of bounds.
4.

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Page 32900, DCA isn't defined or in the figure. 5. Page 32901, Line 8. 'FGS uses ...'. Again, i am no engineer, but i thought these used calcium carbonate and the like to scrub sulfur out of these streams in wet scrubbers. 6. Page 32903, line 3, reference Wu et al., 2006 isn't in the references. 7. Page 32910, line 11-12, sentence ", and found that the mercury" is unclear to me what the release rate means. Do you mean that the emission is 70-90% and the remainder is in the ash? Just unclear. 8. Section 4 is very difficult to follow. You should definitely point people to the figure (#4) at the beginning of the discussion for better understanding by the reader. I agree to understand the system, much discussion is needed. However, an alternative is to shorten the discussion, making the broad points that: 1. Hg in the raw materials comes out in the roasting process, 2. by using the flue gas to preheat the raw materials and coal, the Hg is recycled and is enriched along the way, and 3. that the operational modes vary dramatically and the emissions and ratios will be highly different and have to be accounted for in emission databases. I agree it is complicated and so variable that the process takes a bit of discussion to explain it. 9. Further, in figure 4, i would suggest: a. Add a "clinker out" yellow arrow b. Add a box on the green arrow of mercury from the coal mill and collector that shows it is preheated as described in the text. 10. I would restate in Section 4 at the end, that these process are so highly variable that the emissions inventories are likely to be wrong, or something to that effect. 11. Section 5; many readers will not know what sintering is. I would use a short parenthetical to define. 12. References: a. i did not find Eriksen used. b. Lopez-Anton is referenced as 2007 in the text; check this one c. Takahashi is referenced as 2010 in the paper; check this one 13. Table 1: i would add to the title Table 1. "Average (Range)" Speciation profile of mercury emissions from coal combustion "By Boiler Type and Control Technology (%)". 14. Table 2: same comment 15. Table 3: same comment 16. Table 4: i would add lines between the countries or regions so that they are more easy to compare. Hard with no dividing lines. 17. Figure 1. a. APH isn't defined, and not sure what it is b. The influence of mercury by the FGD was not discussed in the paper. Perhaps there is none, but you have the chemical transformations in the table,

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and would imply that there are implications to the mercury reduction (or addition), and the fractionation between the three Hg types. 18. Figure 2. Minor points here a. The arrows between the boxes; is there any meaning to the different sized arrows. If yes, describe in a caption. If no, make them all the same size. b. Same comment with blue arrows and size. c. Just a question: why is the liquid phase in the Flue Gas Purification box not represented the same way? Is it water droplets? Should it be represented the same way? d. Same box. Does Hg⁰ really get removed by the spray? Is this why the arrow size is so small? too little affinity for water? e. Bottom box: in other boxes the Hg⁰ arrow goes both ways. Is it different here? Only one way? 19. Figure 4: i would add “and flow” to the caption after transformation.

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