

## ***Interactive comment on “How important is biomass burning in Canada to mercury contamination?” by Annemarie Fraser et al.***

### **Anonymous Referee #2**

Received and published: 22 November 2017

The presented paper investigates the impact of wild fires on atmospheric transport of mercury and Hg wet deposition in Canada (and North America). The impact of natural (re-)emissions of Hg on global and regional transport of Hg is an important research question. The employed state-of-the-art CTM and the used methods are appropriate. Moreover, the manuscript is well written. Thus I can recommend publication in ACP after a few (mostly minor) revisions:

- 1) I am missing a discussion on the impact of the general model bias on the EF optimization. In my opinion it would be necessary to first investigate the model performance at the measurement site at times without fire events.
- 2) Please clarify: Did you use the complete 6 year run to calculate the posteriori EFs?

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3) As I understand one main result is that the PBM fraction of Hg emitted from wildfires has a much larger influence on modelled Hg wet deposition than the uncertainty in the emission factors. In this regard, I think that the brief discussion (compared to the discussion of EFs) of the PBM fraction is not adequate and needs to be improved.

First of all I miss a detailed analysis of the impact of different PBM fractions in the wild fire emissions on model performance. Page 10 lines 10-20: Here you must include a table showing statistics on the impact of increased PBM emissions on model-observation comparisons. (similar to Table 3)

4) Table 2: VT-2 becomes a sink for mercury? If you choose to show this it needs to be discussed in the text.

5) In table 3 please indicate for which years the difference between the sensitivity runs is statistically significant.

6) Figure 13 d) Please include all runs (a,b,c) in this figure.

7) The manuscript includes numerous double spaces that need to be removed.

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