

## ***Interactive comment on “Sensitivity model study of regional mercury dispersion in the atmosphere” by Christian N. Gencarelli et al.***

### **Anonymous Referee #1**

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The manuscript reports the model results of a number of carefully crafted sensitivity simulations under different scenarios of mercury emission inventory (AMAP and EDGAR) and chemical oxidation (O<sub>3</sub>, OH and Br) of elemental mercury in air, using WRF/Chem-Hg and CMAQ-Hg. The model results and data interpretation are presented in a organized fashion; and the conclusions are useful for better understanding of the chemical transport of mercury at regional scale. There are a few minor points that can be explained in more detail. I recommend the manuscript be accepted for publication after clarifying the points or providing the discussion of the following:

P4L27. The authors claim that the deposition parameterization does not have an effect on the ratio of simulate dry to wet deposition. This is somewhat surprising and should be clarified.

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Figure 5. The authors rank the ratios from high to low. Discussion should be provided regarding what causes the spatial difference should be provided.

It appears that (1) the variability of simulated concentration does not match the variability of observed concentration, and (2) the simulated wet deposition grossly underestimate the observed values. (Figures 6 and 7). Discussion regarding the reasons should be provided.

It is somewhat disappointing that the authors paid little attention to the simulated concentration of gaseous oxidized mercury, considering the experiment on the oxidation mechanism of gaseous elemental mercury. Discussion around this topic is of scientific interest and should be provided.

After such an expansive modeling assessment, the authors may want to provide a synthesized conclusion regarding regional model configuration (chemistry, emission, etc.) for atmospheric modeling.

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