

Interactive comment on “Emission-dominated gas exchange of elemental mercury vapor over natural surfaces in China” by Xun Wang et al.

Anonymous Referee #3

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The paper proposes a new parametrization of surface fluxes of elemental mercury based on different pathways of reduction of reactive mercury. The model is applied to China, taking into account landuse patterns to estimate emissions of elemental mercury.

The main problem with the study is the minimal evaluation of the model and the lack of details concerning the sensitivity studies. The organization of the results section was puzzling: Sec 3.4 has the evaluation of the model, which I would have expected at the beginning of Section 3. I would have liked to see more details about the evaluation. Figure 8 shows only measurements and was difficult to figure out, it needs a better legend (eg. Units) and the information should be presented in such a way as to help evaluate the model results. Figure 9 contains the information for evaluating the model, but it is difficult to get a clear sense of model performance from this.

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The sensitivity study seemed very limited in scope, with only a low and a high level. It seems there could be a more thorough way of doing this. Figure 2 was difficult to see – cross-sections would probably be preferable. For Figure 3, I was surprised at the magnitude of the changes (around 100 ng m⁻² hr⁻¹) when the fluxes listed in Table 3 are 1 to 2 orders of magnitude smaller.

Because the model is very specific in inputs, it seems to me that the model development part requires a very specific evaluation which is distinct from the application of the model on the national scale. The paper therefore seems to be a curious combination of 2 papers: one paper on model development and one on application of the model to a national scale. However, I think the paper would be acceptable with an expanded description of the model evaluation and an improved sensitivity analysis.

Specific comments:

Sec 2.1.1: It would be good to explain how the model differs from prior work in more detail.

Sec 3.1: It is preferable to talk about “evaluation” rather than “verification.” Model evaluation seems to be in Sec 3.4. Sec 3.1 seems to be a comparison with other studies – a graphical representation may help some of the discussion.

Line 222: Putting uncertainty on the bounds of the ranges seemed like an odd thing to do. Isn't it enough to state the range?

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