

## ***Interactive comment on “Cloud-resolving simulations of mercury scavenging and deposition in thunderstorms” by U. S. Nair et al.***

### **Anonymous Referee #2**

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General Comments: The authors use idealized, cloud-resolving simulations of thunderstorms to determine the fate of mercury in the atmosphere. While I cannot consider it a major contribution, it is a good first cut at determining the environmental factors that influence how a thunderstorm interacts with mercury and might help explain observed climatological mercury deposition. The paper is well-written and, in general, does a good job in making their case. The results, though, hinge on the accuracy of the cloud model (which can be considered state-of-the-art) and the deposition methodology.

Specific comments: I'm happy to see RAMS being put to good use. However, I wonder if the bubble-method to initialize the storms has an undue influence on the results. Real thunderstorms initiate in a much different manner. The authors demonstrate the importance of small changes to initial conditions on the results - I'd expect the initiation

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method to also have such an influence.

The authors should discuss their CAPE calculations in more detail. Are they using most-unstable CAPE, surface-based CAPE, or a mixed layer CAPE? Does it matter to the results? For a given value of CAPE, the vertical distribution can vary - (tall and skinny vs. short and fat). What did the authors use and are the results sensitive to that? I would like to see a multi-panel figure showing some of the soundings used to initialize the model.

I don't consider 1000 J/kg to be 'weakly unstable' except in regards to supercells.

In Fig. 7 b and f why is there such a large difference in the rainwater distribution for a modest change in PW? That's another case where it would be helpful to see the initial sounding.

The authors demonstrate the differences between their various simulations, but don't have much explanation for these differences. For example, they show that shear has a big impact, but why does it?

Technical corrections: Figure 4: 4c is a repeat of 4b. Figure 5: LFP should be LFT in the figure and the caption. Figure 9: caption line 2 red and black are backwards: red is south, black is north.

p 3576, line 14: "deposited mercury deposited" p 3580, line 17: "since it the" p 3581, line 10: "Reginal" p 3584, line 24: "Other possibility" p 3587, line 28: an "increase in SHEAR" p 3591, line 1: "deep thunderstorm"

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