

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

Anonymous Referee #4

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I agree with the comments of Reviewers I and II that the model could/should have been used to model nitric acid entrainment and deposition for which there are lots of ambient data. There is not enough rainfall Hg data collected on an event basis to constrain (or verify) the model. However, I disagree that the paper should not be published without such data. I also do not agree that the authors **MUST** propose a set of testable hypotheses to go with their model. This can be the focus of future work. The model framework described in this paper may prove useful for modeling the behavior of other scavengable gases and particles in the atmosphere, and is therefore worthy of publication.

The subject of this paper, an effort to explain why Hg rainfall deposition is dispropor-
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tionally higher in the southeastern US while the US emission sources are located much farther north, is a very important topic. Atmospheric deposition of Hg is ultimately responsible for elevated fish Hg levels throughout the SE US and the Gulf of Mexico, yet most of the Hg emission sources are located much farther to the north. It has been proposed that tall convective thunderstorms are responsible for enhancing rainfall Hg deposition in the SE US, and this paper represents an attempt to model why that should be the case. If this model proves to be reliable, then it offers a tool that can be used in to predict how changes in Hg emissions in the US and on a global scale will affect fish Hg levels in the region. This tool could also be used along with estimates of the sources and in-situ formation rates of gaseous oxidized Hg in the atmosphere over the SE US for more accurate source apportionment analyses.

Specific comments keyed to page, line number:

3579, 10: Small-scale turbulence. . .

3579, 15: Subsequent evaporation of cloud droplets. . .

3580, 6: . . .in more stable environments.

3583, 21: naming convention is used before it has been defined on 3584, line 21.

3585, 22: . . .whereas it is only 19%...

3588, 16: Spatial (domain) and temporal averages. . .

3591, 17-18: Last sentence is not a complete sentence. Delete the word “since” and it would be OK.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 3575, 2013.