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Atmospheric Chemistry and Physics Discussions

Interactive comment on "How relevant is the deposition of mercury onto snowpacks? – Part 2: A modeling study" *by* D. Durnford et al.

Anonymous Referee #3

Received and published: 3 May 2012

This paper describes the simulation of mercury deposition to snowpack from a highly descriptive model of mercury processes in snowpack and the comparisons of this model output with observations. The new model includes a significantly higher level of complexity than other published models. The model agrees with observations somewhat but individual point measurements are sparse, not always continuous, and may be influenced by regional processes. This study highlights the influence of ocean emission on ambient mercury concentrations, revolatilization of mercury from snowpack and the complication in studying AMDEs with respect to understanding the long-term deposition or movement mercury in arctic, subarctic and mid-latitude environments. This study is novel, carefully conceived and executed and demonstrates a significant contribution to the understanding of mercury processes in mid-to-high latitude environments and is recommended for publication with only minor revisions.

Comments/suggested edits:

P 2648 line 20: define GEM before using the term

p 2650 lines 16-19: This sentence would be less awkward if 'whether in association with AMDEs or not' was moved to after 'partially revolatilzed'

p 2651-2653. I find the descriptions of previous modeling disrupted by the description of this "three-part study" which is made up of one prior publication and then this and a sister publication (Part 1). The statements about how prior models were 'simplistic' (p2651 line 8), or not 'anywhere near its full complexity' (p2651 line 22) seem to beg for the explanation of what is complex about mercury processes in snowpack, which to a certain extent is a part of a prior body of knowledge, whether or not that was the first part of a longer study (Durnford and Dastoor, 2011). This section would be more straightforward if the Durnford and Dastoor 2011 publication were treated as part of the literature review. Then the authors can introduce the companion paper to this one (Part 1) without talking about a three part study with one published work and two companion papers and the language of "We" (p2651 line 23) and "They" (p2651 line26) which seems unnecessarily complicated.

P 2675 lines 12-16. In your description of 'yearly accumulation' could you explain some processes that would be included in this calculation that are not included in net deposition? An example or two would help distinguish between accumulation and deposition

Figures: Figure 3: This figure seems difficult to read except in pdf. I would suggest moving 'as observed (red)' to directly before the descriptors of the simulations.

Figure 4. I don't understand what the individual columns are. Are they individual years? You don't use the a) b) c) labels in the caption and that will be helpful in identifying the multiple graphs.

Figure 6. Include the descriptors a) b) c)... in your caption for clarity.

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Interactive Comment

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 2647, 2012.

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