

Interactive comment on “Overview of mercury measurements in the Antarctic troposphere” by A. Dommergue et al.

Anonymous Referee #4

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General comments

This manuscript, focused on reviewing the available research on mercury measurements in the Antarctic troposphere, is a great start on the topic. It is timely and a good effort.

There are numerous English and grammatical errors throughout the manuscript. I suggest that for this work and work in the future the authors ask a friend to proofread for English and grammar. None of the typographical or other errors are significant and none impact the quality of the work. However, as a Reviewer I find it is difficult to see the entire story through the numerous small problems.

This work is likely of interest to the readership and provides a “state of the science” for

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Antarctic tropospheric chemistry with respect to mercury. That said, this paper could benefit from some minor to major revisions as outlined below:

Specific comments

1) The information on measurement methods (2.1.2) could be relevant and helpful. However, much of this is not from cited information. As a consequence it is either so “commonly known” that perhaps it is not worth having in here or it needs some citations so as to add new content to the Review. If is simply a rehash of what everyone already does, and has no specific significance to the Antarctic then why is it here? I could see this going either way.

2) Make sure all acronyms are spelled out. I think “DOAS” is never spelled out or I missed it. “RHS” too.

3) Page 26883 lines 10-17. Here and in other potential locations in the manuscript a comparison to the Arctic may be worthwhile. The authors mention repeatedly that there is far more research results in the Arctic. Why not highlight places where these results are similar to the Antarctic and where (and why) they may be different or not applicable. I realize the authors have an Antarctic focus and that is worthy. However if they want to repeatedly state the missing Antarctic information they should fill in blanks (where available) to show how the Arctic results could be applied or not. They seem to be in the best position to provide this to the research community. Perhaps a section on the comparisons and contrasts is warranted and would make this both a stronger paper and on that Arctic researchers could learn from. Maybe this information is best for the conclusions? Section 2.3 does this a bit but perhaps instead of focusing only on the Reactivity it could be expanded by a paragraph or so to further discuss the role of sea ice, coastal phenomena, precipitation, inland processes, halogen chemistry? Could probably fit into one paragraph- not a total expansion.

4) Page 26680, lines 7-11: Is it widely assumed that the frost flowers are the halogen source or is this a hypothesis? The authors make it sound like a fact but I see it as more

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of a hypothesis with young ice (not necessarily with frost flowers present), snow blown over ice, and/or open water potentially providing halogen sources (see Kaleschke et al., 2004 GRL versus Simpson et al., 2005 GRL).

4) Page 26882, lines 5-6. “High” values are mentioned. Please give the range and a comparable range so that the reader can assess what “high” means in this case.

5) Page 26883 lines 25-28: This sentence is confusing. The 10 cm of snow (or water equivalence) per year is somehow associated with 10% of the deposited mercury being buried. Can this be elaborated a little bit beyond simply citing Brooks et al.?

6) Page 26685, line 28: What “surfaces?”

7) Figure 1 is difficult to read. Might just be my copy but be aware of this.

8) Can Figures 1 and 2 be set up so that they are both aligned the same way? Ie with zero degrees North (or whatever makes sense) oriented similarly in both. The Antarctic Peninsula is to the upper left of Figure 1 but to the upper right of Figure 2. Since the authors discuss sea ice and its presence/controls on mercury chemistry it may make sense to provide a summer and winter view of ice extent (or maybe just a summer one is fine, of course). This would highlight the BrO measurements in Figure 2. It could be reference thus on Page 26680, line 11

9) Does Figure 2 represent a “typical” view of halogen chemistry with respect to geography and ice or is it selected for a reason? Regardless, the reasoning for this specific figure (as common or an anomaly) should be stated.

10) The authors do not mention snow very much. There has been a lot of work on clear sky precipitation, snow, blowing snow in Antarctic and this likely plays a role in the potential for snow and AMDEs. Ie see Domine and Shepson Science 2002 with respect to snow chemistry, ice cores, long term records. I realize the focus here is on tropospheric atmospheric chemistry but obviously ice core results (and the archives they represent) are the only applicable way to address long term deposition for mercury.

This also could be used to further show why the inland measurements (which are few for mercury in air but many for snow and ice cores) are needed.

Interactive comment on Atmos. Chem. Phys. Discuss., 9, 26673, 2009.

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