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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Atmospheric mercury over sea ice during the OASIS-2009 campaign" *by* A. Steffen et al.

Anonymous Referee #2

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General comments

The manuscript presents novel measurements of atmospheric mercury species collected on the sea ice close to open leads during springtime near Barrow, Alaska. At the same time measurements were also performed over the tundra, and it is obviously very tragic that the tundra experiment suffered from instrument problems. The results presented are very interesting and add new insight to our understanding about the mercury cycling in the Arctic. For those who have hands on experience with this type of mercury instrumentation and have been working in the Arctic knows how challenging, not to say difficult, it can be to achieve reliable data, so therefore applaud the effort undertaken in this study. However, the results as presented are lengthy, in particular the discussion about the RGM:PHg relationship and influence of different meteorological

factors, and I would suggest to tone down this part. The comparison of GEM data from the sea ice and over the tundra, and the finding that more mercury is retained in sea ice snow is the most interesting finding and also most important in terms of the Arctic mercury cycle, so this should get more attention in your discussion. The manuscript certainly merits publications but need some revisions.

Specific comments

Page 5690, line 15-21: The Jacobi et al., 2006 (JGR) should also be included here.

Page 5692, site descriptions: When the authors describe the OOTI sites, it would be great for the reader to know the distances from the sites to the shoreline and the distance between the sites to be able to put things into perspective.

Page 5696, line 7: The authors apply the same AMDE limit as defined for Alert. How applicable is this limit for Barrow?

Page 5696, line 15: The authors list two GEM means; 1,54 and 1.70 ng/m3. What do these means refer to? Please clarify.

Page 5696, line 17-18: The sentence: "The average concentration reported on the sea ice in this study is lower than the lower spring time average for Alert". This is an interesting observation. Can the authors please provide some thoughts on why this is the case, as I cannot find this anywhere in the manuscript.

Page 5696, line 21-22: The presented concentrations of RGM are much lower than those presented by Lindberg et al., 2002 (ES&T). Any thoughts on why this may be the case?

Page 5706, line 12-13: Referring to the average Hg content in the sea ice snow and the tundra snow. How many samples are these numbers based on and perhaps median would be a more reliable number as Hg content in snow tends to be very inhomogeneous, as also presented by the standard deviations.

Page 5726, figure 6: The figure presents BrO and PHg/RGM measurements over sea ice and BrO and GEM over tundra. The BrO data looks equal in the two panels, is it the same data? This is a bit confusing. The figure caption states the different events are marked yellow, purple and blue, however the purple and blue looks the same my printout so it may be advisable to choose different colors.

Technical comments

Page 5691, line 10-11: The sentence starting with “Currently, modelers use a number of roughly 50% . . .”. It is not clear from the text whether the number in this sentence refers to the fractions of retained or re-emitted mercury. Please clarify.

Page 5694, line 24-25: There seem to be a grammatical error in this sentence.

Page 5695, line 5: The melted snow was filtered through acid washed polypropylene filters, however it is not mentioned which acid was used. I believe the reader would like to know what acid was used as the type of acid can influence the results depending on which ions are of interest.

Page 5695, line 6: 18 MW water? Should it be 18 MâĎę? Is there perhaps some conversion problem.

Page 5702, line 23-24: There seem to be a grammatical error in this sentence.

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 5687, 2013.