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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Step changes in persistent organic pollutants over the Arctic and their implications" *by* Y. Zhao et al.

Anonymous Referee #2

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This paper examines the step point of the atmospheric concentration of POPs in the Arctic using three statistical analysis. The authors modeled the relative contribution of secondary emission from sea-ice/water on the atmospheric concentration of POPs, to primary emission and degradation. The authors employed long-term monitoring air data from four Arctic stations for their analysis. The paper is well-written but requires improvement on the figures. The paper is suitable for publication pending on the response to the following comments.

General comments:

I think the authors should only show the highlights of the results in the figures instead of everything. For example, Figure 1, 2, 3 and 4 are showing the same results from the

step change statistical analysis for the 4 Arctic stations. There are too much information here. Perhaps the authors can just show the significant results and put the rest into the Supplement. The authors should also simplify Figures 5 and 6.

There are very limited data on the concentration of POPs in ice and they may be of high uncertainty. Have you tried running the model with different ice concentration? I see that you have used the measurements from Hansen et al., for a-HCH in ice and snow concentration. Have you considered using recent measurements from Pucko et al. Environ. Sci. Technol., 2010, 44, 9258-9264.?

Have the authors considered air-brine gas exchange and how would that be affected by climate change?

The authors have identified the step points for a number of POPs with the hypothesis that rapid melting of sea ice and rising of temperature is the cause. Does the observed step change coincide with the model results? It is not clearly state in the paper. Maybe the authors can elaborate on this point.

The authors often described the model concentration as ”perturbation concentration”, which seems awkward. I think it should be called ”perturbed concentration”or just ”modeled concentration. It does not sound right when you put two nouns together.

Specific comments: p. 1249, line 14, ”duo” should be ”due”

Supplement, Reference Hansen et al., "r-HCH" should be ”a-HCH”? or "g-HCH"? Please double check.

Interactive comment on Atmos. Chem. Phys. Discuss., 15, 1225, 2015.