

16 November 2017

Anonymous review of Kuss et al., 2017, High-resolution measurements of elemental mercury in surface water for an improved quantitative understanding of the Baltic Sea as a source of atmospheric mercury, *ACPD*

General comments

Kuss and collaborators present high-resolution measurements of Hg^0 in seawater and air-sea fluxes in the Baltic Sea. High-resolution measurements make an important scientific contribution to the field. Ocean emission are large global source of Hg to the atmosphere and, as pointed out by the authors, there is considerable uncertainty in air-sea fluxes and so I'm very glad to see the authors working in this area.

I recommend the manuscript of publication after revisions. The manuscript is clearly written and logically organized. The greatest area for improvement is Section 3. Section 3 currently reads as a dense report-out on results and is a bit too light on the discussion. It would greatly improve the manuscript to add more insight and context to Section (i.e., tell the reader why the results matter, how the results change or add to existing knowledge, and the implications).

Specific comments

Page 1, line 16: The use of "major" is ambiguous. Major in what context? A major source in the Baltic region? In the global context, it's small (<1% of global ocean emissions). Consider deleting "major", replacing with a quantitative statement, or clarifying the context in which it's a major source.

Page 1, lines 18-23: "A membrane equilibrator enabled continuous... Hg^0_{wat} could also be characterized in deeper water layers." This level of details seems more appropriate the Methods section than the Abstract.

Page 8, lines 10-17: This paragraph is especially dense with numbers. Consider summarizing in a table instead of the main text.

Page 9, lines 25-27: "Upwelled water affects areas.... We conclude that upwelling contributes significantly to Hg^0 emissions." This seems like an important result and merits further elaboration. Why does this matter? How does it change or add to the current understanding of what's going on in the Baltic or other marginal seas?

Page 11, lines 21-22: A 60% difference is substantial. If Nightingale 2000 and Weiss 2007 yield such different results, what's the implication for current global budgets of ocean emissions?

Section 3.6: What the relationship between the emission budget presented for the Baltic Sea and the trends stated in the introduction (decline since 1990s, relatively flat since 2006)?

Data availability: I strongly encourage the authors to make the un-averaged data available, in addition to the averaged data. Un-averaged data will be of greatest interest to modelers want to compare simulated and measured values.

Figure 3: It's really hard to distinguish the symbols for $\text{Hg}^0_{\text{wat}}(1)$ and $\text{Hg}^0_{\text{wat}}(2)$. I'd suggest using two colors with greater contrast.