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Comment

Interactive comment on “Chemical and physical transformations of mercury in the ocean: a review” by N. Batrakova et al.

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The authors are thankful to the Anonymous Referee 1 for the critical review of the manuscript. We agree with most of the Referee’s comments even taking into account generally non-constructive character of the review. Nevertheless, we cannot agree with the main conclusions. As it is correctly mentioned by the Referee the paper contains a survey of various processes affecting the whole cycle of mercury transformations in seawater including oxidation and reduction under different conditions, adsorption on suspended particles and colloidal matter and methylation. It is important to mention that consideration of the whole scope of the processes is crucial for development of both oceanic and coupled multi-media models of mercury cycling in the environment. It means that mercury methylation in seawater is definitely important, particularly from

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the viewpoint of human exposure, but not the only process affecting the entire mercury cycle in the ocean. Therefore, it is somewhat surprisingly to see that all the criticism of the manuscript by the Referee is focused on some mistakes in description of one of the processes (methylation) that allows to make the conclusion on acceptability of the whole paper.

On the other hand, the critical comments made by the Referee can be easily addressed in the revised manuscript that should considerably improve the paper. Below there are responses to particular Referee's comments (original comments are in *italics*).

The most central paper on methylation rates that has been published in the last couple of years, Lehnherr et al. 2011 (Nature Geoscience), is not mentioned in the manuscript at all. This paper contains the most comprehensive work on rate constants for methylation and demethylation (photolytic and biotic) in the ocean to date.

The main ideas of the paper as well as the rate constants have been included to the revised manuscript.

The fact that the authors are not aware of this study, which should be central in their review, is one of many indications that they are not up to date with the literature.

It seems that the Referee misread the manuscript. As it was mentioned above the scope of the study is much wider than just description of the mercury methylation process in seawater.

The manuscript several places refer to sediment MeHg production as the most likely or an equally likely source of methylated mercury to the water

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column (page 4 line 8-12; page 20 line 16-18; page 26 line 9-15). The authors should read other recent reviews (and the studies referenced in these) that present recent evidence that water column production is the most important source of methylated mercury in the open ocean (see reviews by Mason et al. 2012, Kirk et al. 2012, Driscoll et al. 2013).

The chapter of the manuscript describing mercury methylation in seawater has been considerably rewritten taking into account the recent studies. In particular, it is clearly stated that the major source of methylmercury in the open ocean is in situ methylation in the water column. However, other sources (export from coastal and deep-sea sediments, river systems, atmospheric deposition etc.) can also be important in some specific environments (e.g. estuaries and near-shore areas).

In the last paragraph before the conclusion the authors refer to the relative stability of methylmercury in ocean waters and say that this stability is an indication that sediments and coastal area production of MeHg could be important for open ocean uptake of MeHg in fish. I am not sure what “relative stable” refers too but Lehnher et al. (2011) finds that the lifetime of MeHg in the Arctic Ocean is 2-5 days, which indicates that methylmercury is far from stable and does not support long range transport of MeHg within the ocean but support water column production as the major source.

Again, the discussion of the methylmercury potential to long-range transport in the ocean has been reformulated in appropriate section of the manuscript taking into account recent estimates of the lifetime of methylmercury in seawater (Lehnher et al., 2011).

Interactive comment on Ocean Sci. Discuss., 11, 1, 2014.