

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

**Anonymous Referee #2**

Received and published: 28 February 2014

In this paper, Batrakova et al. reviewed the major chemical and physical transformations of mercury in the ocean, including oxidation and reduction, methylation and demethylation, and adsorption on particles. The review is fairly comprehensive, compiling the previously reported values of important kinetic (e.g., reaction rate constants) and thermodynamic (e.g., partition coefficients) parameters associated with these processes. As a summary for previous studies, this review paper would be a useful reference for investigating mercury cycling in the ocean. Nonetheless there are a few points in the manuscript that need to be clarified (see comments below).

1. Page 4 Line 6: What does "reactive mercury" mean? As reactive mercury is operationally defined, more information is needed here to clarify what mercury species are considered reactive mercury.

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2. Page 4 Line 21: The statement "whereas Hg(II) is the predominant form found in water" might not be necessarily true in some cases. For example, surface ocean water could be supersaturated with respect to elemental Hg, which could account for a considerable amount of total Hg (e.g., approximately 50

3. Page 7 Line 13: Does "reduction" refer to photoreduction?

4. Page 8 Line 23: A wide range has been reported for the stability of Hg(II)-DOM complexes, with the logK ranging approximately from 10 to 40. The range given here might not be the representative stability constants of Hg(II)-DOM complexation, as higher stability constants (logK about 20-40) are probably more reasonable.

5. Page 11 Line 22: For the statement "The rates of oxidation reactions are higher under solar irradiation", compared to what? In comparison to dark condition?

6. Page 12 Line 3: Chloride (Cl<sup>-</sup>) and bromide (Br<sup>-</sup>) may be involved in the processes of Hg(0) oxidation, but from a chemical perspective it is probably inappropriate to say they are oxidants, as they cannot accept electrons. Maybe chlorine and bromine atoms are referred to here?

7. Page 19 Line 18: The bioavailability issue of colloidal mercury is much more complicated than a simple statement that colloidal mercury is poorly bioavailable. Recent studies have suggested that in colloidal form, in particular at nano-scale, some mercury species (e.g., HgS nanoparticles) could be bioavailable for bacteria that methylate inorganic Hg into methylmercury.

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

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