

## ***Interactive comment on “Distribution and air-sea exchange of mercury (Hg) in the Yellow Sea” by Z. J. Ci et al.***

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General comments: The paper “Distribution and air-sea exchange of mercury (Hg) in the Yellow Sea” by Ci et al. represents an important contribution to the understanding of marine Hg cycling in that region. The study area is of special interest since it is assumed to be affected by an increased mercury burden originated from eastern Asian countries. The authors present data of different Hg speciations in surface water and of GEM measurements in the atmosphere mainly to estimate the air-sea exchange of elemental mercury (Hg(0)). The paper is well structured and clearly written. However some issues require a more detailed elaboration. Especially, more information about wind speed and surface water temperature are necessary to understand the calculated Hg(0) air-sea exchange fluxes. Moreover, the fluxes require recalculation by using

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a reliable estimate of the mercury diffusion coefficient and perhaps by application of average wind speeds (see specific comments). The paper would also clearly benefit by including temperature and salinity depth profiles into the discussion. For some presented values the number of decimal places should be checked and adapted to the estimated precision of the method.

Specific comments:

P. 1512, Lines 15/16: supersaturation, the term seems not adequate for trace compounds since it suggests something like sparkling mineral water. It is in fact just a disequilibrium. I'd propose to avoid the terms saturation/supersaturation throughout the manuscript.

P. 1512, Line 18: Please check the precision of the determination (e.g.,  $23 \pm 15$  ng m<sup>-2</sup> h<sup>-1</sup>).

P. 1513, L. 8: toxin refers to methyl mercury, but the biogeochemistry of Hg is analyzed. I suggest to replace “this toxin” by “mercury”.

P1514, L.3: production – transformation reaction (since Hg is an element)

P.1516, L.2: A sampling time of one minute is not much. What was the sample flow rate?

P. 1519, L.7/8: An estimation of the diffusion coefficient by the Wilke – Chang method is not the best choice for Hg(0). This is based on a correlation of D of organic compounds. Based on the study of Kuss et al. (2009) the D-Hg(0) is about 50% too high by application of the Wilke-Chang method. I suggest recalculation of the fluxes by using the recently proposed diffusion coefficient (Kuss et al., 2009).

P. 1519, L. 15: Also the term saturation is misleading.

P. 1523, L. 26: Were the acidified samples analyzed on board? The RHg/THg ratio might have been shifted due to the storage time (dissolution of e.g., particulate mate-

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rial).

P. 1526, L. 24: I wonder if a flux of 55 ng/m<sup>2</sup>h can be realistic. This is 1.3 µg/ m<sup>2</sup>d enough to fill a 500 m air column to 2.6 ng/m<sup>3</sup> just in one day. This is at the upper end of average Hg emissions of industrialized areas. Perhaps it was lasting for a short period only. Was this flux value calculated by using a peak wind speed? This issue requires some discussion/explanation in comparison to contaminated air masses from land.

P. 1528, L.8-L.12: Was the whole wind speed distribution used for the calculation of each flux? Please give some more details about the transfer velocity calculation (e.g., as table with all relevant data).

P. 1528, L. 16: If vertical profiles are presented information about water density structure (temperature, salinity) are necessary. See general remarks. Especially if mixing processes, surface layer or bottom sediment re-suspension is discussed (P. 1528, L. 25/26). Also the meaning of a 1.3 µg/m<sup>2</sup> daily emission can be better judged.

Technical corrections

P. 1513 L.16: have showed - have shown

P. 1513, L. 24: spicie - species (it is also singular).

P. 1526, L. 8: Please check the number of decimal places, i.e. the precision of the DGM saturation.

References

Kuss, J., Holzmann, J. and Ludwig, R., 2009. An elemental mercury diffusion coefficient for natural waters determined by molecular dynamics simulation. *Environmental Science and Technology*, 43(9): 3183-3186.

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