

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

**Anonymous Referee #2**

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General comments:

The paper “Distribution and air-sea exchange of mercury (Hg) in the Yellow Sea” presents data on atmospheric Hg<sup>0</sup>, and aquatic total Hg, reactive Hg and DGM from the atmospheric outflow region of Asia. In the paper calculation and analysis of air-sea fluxes is also made. The paper is mostly well written and the data is an import contribution for the understanding of the spatial distribution of atmospheric and aquatic mercury.

I am wondering if there are any ancillary atmospheric data on CO, O<sub>3</sub> or other species? This could greatly strengthen some of the interpretations on the influence from anthropogenic sources.

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When comparing fluxes it is important to remember that others papers might have used different methods for the flux calculation. Including a table in the supporting information with ancillary data including e.g. wind speeds and temperatures for the flux calculations as well as some words on this would help the reader understand the importance in the different air-sea flux estimates better.

Is there any possibility to make some statistic comparison between this cruise and some of the other cruises presented in Figure 2?

I would recommend removing words like “clearly” and “significantly” from the text when referring to comparisons of different results. “Clearly” is a very subjective word when considering the large standard deviations on most results. “Significantly” should be followed by an indication of the significance level for the statement (e.g. (P<0.05)) otherwise I would suggest only stating that averages are higher or lower than each. When no standard deviations are given on some of the averages you compare to you should be even more careful with the choice of words. If you have made a statistical analysis please state this clearly and give the test and the significance level of the result.

Specific comments:

1512 line 21: Can the three fractions of mercury measured in the waters be referred to as species? Total Hg is certainly not.

1514 line 7-9: I am a little bit unsure about what you want to say here but I think (as a number for the contribution of evasion compared to deposition) the Strode et al. paper only report 60% re-evasion. In any case you might want to reference the updated version of the GEOS-Chem slab ocean model by Soerensen et al. (2010, “An Improved Global Model for Air-sea exchange of Mercury: High concentrations over the North Atlantic.”). They found re-evasion to account for 80% of depositions.

1517 line 4: “Due to the low depth of the” – I am not sure why the low depth of the

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Yellow Sea is a cause for selecting three station and make vertical profiles? Can these not be made if the water is deeper? Maybe change the formulation?

1520 line 4: Is the mean and the median concentrations the same?

1521 line 4 and 23: Maybe a reference to Lindberg et al (2007) or Sprovieri et al (2010, "Worldwide atmospheric mercury measurements: a review and synthesis of spatial and temporal trends") would be more general and updated references for background concentrations in the northern hemisphere?

1521 line 13-14: Please state what you compare to when you say that concentrations are elevated near the coast and decreased in the open ocean. Maybe say they are elevated at the coast compared to the open ocean?

Page 1523 line 4-23: Why compare to the cruise mean when many of the other samples are also made close to land and might be affected by smaller rivers etc. Why not compare the CJ-2 to CJ-7 stations with samples taken a certain distance from land? Use for an example a t-test to see if those samples are statistically significant different from the ones near the river mouth? This would give a much better idea of the possible influence from the river. You could also test if there is a trend from the CJ-2 station closest to the coast and as you get further away.

Page 1523 line 26: This sentence is strange. RHg is not large at the coast because concentrations in the open ocean of THg are small. Reformulate.

Page 1524 line 11: Does the RHg/THg fraction give any indication of the dynamic cycling? If the part of the THg fraction that is not RHg is thought to be mostly inactive then it is only the actual RHg level that tells us anything about how dynamic the system is?

Page 1525 line 13-29: Maybe elaborate a little on the fact that, if there is an extensive amount of algae in the water, light will not penetrate very far into the water column. In this case I would expect that photoreduction (and oxidation) would be of less impor-

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tance in the water column even if the insolation is high.

Page 1527 line 27-29: Should this reference be to the Soerensen et al. 2010 paper (An Improved Global Model for Air-sea exchange of Mercury: High concentrations over the North Atlantic.)? They treat the D suggested by Kuss et al (2009) in the Supporting Information of their paper. I don't recall it being treated in Strode et al (2007) paper.

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