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Interactive comment on "Seasonal changes in gaseous elemental mercury in relation to monsoon cycling over the Northern South China Sea" *by* C. M. Tseng et al.

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Response to N.-H. Lin on ACPD

We thank Prof. Lin for his insightful comments on our manuscript. However, we do not view our data as being inconsistent with the three studies he cites. For example, the two land-based measurement campaigns (Li et al. and Friedli et al.) show that GEM can be very high in air travelling off mainland China on its way to the South China Sea (SCS), and much higher than measurements presented in this manuscript. The winter time 2008 average of 2.94 ng/m3 in the Pearl River region (near Hong Kong) reported by Lin is substantially lower than our winter time average for SEATS of 5.7

ng/m3. These are of course two different locations, and thus it may be difficult to directly compare the findings at these two sites. The Li data show large excursions to very high GEM values and which are usually associated with colder temperatures. This observation is consistent with ours in that colder temperatures are associated with more NW transport to the region, bringing higher GEM from the more industrialized parts of mainland China. However, these are two different sites with very different climatologies, and comparison between them should be done carefully.

The data reported by Fu et al. was ship-based, and perhaps more appropriate to compare to our data. Indeed, and as noted by Prof. Lin in his review, our seasonal average compares well with those of Fu et al. (a single cruise in September of 2008). However, Prof. Lin points out that when Fu et al. occupied stations near the SEATS time series station, they found lower GEM concentrations than our seasonal average. We respectfully submit that this is not an appropriate way to assess the quality of our data, since none of the samples we have presented were collected during the same time period as Fu et al. Although our data set from a single location in the SCS spans the longest time period from ship-based sampling, it is still as set of "snapshots," as are the data from Fu et al. What should be clear from our work and that of Fu et al. is that GEM over the SCS is very heterogenous, with transport playing a major role in determining the concentration observed at any given time. This transport can show seasonal trends (as we have attempted to describe), but can be highly variable even within a season. Thus, Fu et al. documented low GEM concentrations near SEATS at a time when transport was from the open ocean of the NW Pacific, while our more seasonal average data suggests that September might be higher than the Fu data on average. This does not in anyway discredit the results published in Fu et al. (or Li or Friedli), nor should in a priori cast doubt on the validity of our values either. This kind of variability is exactly what one should expect when sampling in relatively close proximity to a major source region like Mainland China. This is because the direction of transport and the vagaries of incomplete mixing will combine to generate highly variable concentrations in space and time. However, the real power of repeated measurements

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at a single location in a region like the SCS is to begin to discern seasonal (and even diurnal) trends in the data that single cruises are hard-pressed to resolve.

Thus, we respectfully suggest that our results as well as those of Fu, Li and Friedli are correct and combine to give us a better picture of the distribution and change of GEM in the SCS region. We will add some text to the final version of our manuscript to clarify our position.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 12203, 2012.