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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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This manuscript describes concentrations and seasonal trend of gaseous elemental mercury (GEM) measured at the SouthEast Asian Time-Series Study (SEATS) station between May 2003 and December 2005 using a self-developed technology. The seasonal trend of GEM concentrations (winter > fall > spring > summer) seemed interesting; however, absolute values of GEM seemed very high compared to the data reported by others. For example, the authors claimed that their summer mean value (2.8 ng m⁻³) is comparable to that reported by Fu et al. (2.6 ng m⁻³; 2010). Nevertheless, GEM data reported by the authors were measured in a relatively confined

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area (SEATS station), whereas the data reported by Fu et al. (2010) were collected during a cruise circumnavigating the northern SCS from Guangzhou (China), Hainan Island (China), the Philippines, and back to Guangzhou. GEM data reported by Fu et al. (2010) demonstrated the spatial distribution of GEM over northern SCS in summer: elevated concentrations near the coastal sites adjacent to mainland China and near background values (1.5-1.7 ng m⁻³) over the open ocean (Table 1 and Fig. 2 of Fu et al.). In fact, Fu et al. made a GEM measurement near the SEATS station during their cruise (Site 25 in Table 1 of Fu et al.) and its value is 1.69 ng m⁻³, much lower than the values reported by the authors. Besides, Fu et al. (2010) showed that marine air masses from the Pacific Ocean and deep SCS were usually associated with background GEM concentrations (1.5-1.7 ng m⁻³; Fig. 3 of Fu et al.), indicating relatively clean marine air masses. In contrast, this study indicated elevated GEM concentrations (2.2-3.0 ng m⁻³; Fig. 1 of this manuscript) in marine air masses from the Pacific Ocean and deep SCS.

The authors suggested that regional monsoon activity may transport anthropogenic Hg emitted in the Euroasia continent to northern SCS in non-summer seasons, resulting in elevated GEM values. If air masses pass eastern or southern China before reaching the SEATS station, lower GEM levels at SEATS station compared to at continental sites would be expected due to mixing with cleaner marine air and dilution during transport. Li et al. (2011) reported a winter mean of 2.94 ng m⁻³ for TGM measured in Pearl River Delta region, a highly industrialized region in southern China neighboring SCS. This value is about half of the winter mean value of 5.7 ng m⁻³ measured at SEATS station. Friedli et al. (2011) reported a September mean of 2.7 ng m⁻³ for TGM measured in Shanghai, a megacity in eastern China. This value is also lower than the fall mean value of 3.8 ng m⁻³ measured at SEATS station. It doesn't make sense to have higher GEM concentrations over the open ocean than in industrial region or urban area in China. Therefore, it would be great if the authors can discuss this inconsistency to improve the clarity of their manuscript.

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