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Interactive comment on "Measurements of atmospheric mercury in Shanghai during September 2009" *by* H. R. Friedli et al.

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On pages 30289, lines 7-11, the authors have attempted to discuss the contributor to observed TGM during the plume events based on the SO2, CO, and NOx. This method seems too simplified since the sampling site is bordered by major traffic arteries (Fig.1), where the emission of NOx is much higher than SO2. For example, based on data of table 1, the ratio of NOx/SO2 is 11 on the "background" period, when the air is from easterly oceanic air, much higher than "major" period. More Elemental composition analysis is needed to discuss the source of TGM.

Response:

First of all, we thank the reviewer for the helpful comments.

We agree that we have under appreciated the importance of NOX from transportation in Shanghai (SH). Zhang et al., (2009), which is cited in the manuscript, reported that for SH in 2006 the contribution from transportation to the NOX budget was 24.5%. For our measuring site in Pudong, the relative contribution may be even higher due to the proximity to major traffic arteries. Transportation is a major contributor to NOX, but it is only an insignificant contributor to TGM. The reviewer points out that NOX during background oceanic flow, major and minor plumes, as well as for the data composite varies much less than do CO and SO2, indicating close by transportation sources. The correlation coefficient TGM/NOX reaches 0.7 only during the major plume. We find it useful to work with enhancement ratios (difference between background and plume) in place of NOX and SO2 concentrations.

We have modified this paragraph in Section 3.3 as follows:

"SO2, NOX, and CO are the most relevant tracers for TGM. While SO2 and NOX are co-emitted with Hg from CFPPs and nonferrous smelting processes, their relative abundance vary greatly among industries, fuel types, degree of pollution abatement and within each source categories (Lin et al., 2010; Lu et al., 2010). This difference in abundance provides a way to identify the dominance of coal combustion or smelting in the TGM plume that we observed in this study. High temperature combustion of coal in CFPP, in conjunction with increasing control technologies, results in relatively low SO2 and high NOX emissions. On the other hand, the high sulfur content in the ore during smelting results to relatively high SO2 emissions from large-scale smelters. For Shanghai in 2006, Zhang et al. (2009) reported anthropogenic NOX and SO2 emissions in the year 2006 of 631 and 618 Gg/year, respectively (ratio of 1.02). This is a shift from SO2 to NOX dominant source in Shanghai reported by an early study by Streets and Waldhoff, (2000) for the year 1995. Our data show that the NOX mass loading during the background period of this study is a factor of 11.6 higher than the SO2 mass loading. This factor is calculated using a Monte Carlo approach to account for the large variability in the mass loading (Table 1). In particular, a large sample of

NOX and SO2 mass loading was drawn from a multivariate lognormal distribution using mean and standard deviation shown in Table 1 and correlation factors shown in Table 2. The high NOX suggests the dominance of combustion from the transportation sector as a local source (background) of NOX observed at the Pudong site. On the other hand, the ratio between the enhancement (relative to the background) in NOX and SO2 mass loading within the major plume is 1.4 $\pm$ 0.1 based on a similar Monte Carlo simulation. This ratio suggests a relatively NOX-rich pollution (on top of the local source from transportation) during the major plume event. This pollution is further characterized by a significantly high correlation between TGM and NOX (R=0.8) relative to the background (R=0.3). Because transportation is a minor contributor to TGM during the major plume event, our data indicates that NOX-dominant sources like CFPPs contribute largely to the observed enhancements in TGM relative to SO2-dominant pollution from smelters. The larger contribution of CFPP to observed TGM is supported by Streets et al. (2005) for Shanghai in September."

Overall Response: The full MS has been edited and the above described changes incorporated into the final MS. Additions to the acknowledgments were made.

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 30279, 2010.