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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Characteristics of atmospheric total gaseous mercury (TGM) observed in urban Nanjing, China" *by* J. Zhu et al.

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We thank the referee for the positive comments and suggestion. In our response, we have addressed all of the concerns of the reviewer and revised the paper accordingly.

Q: Firstly, natural emissions in urban areas are supposed to increase because reemissions of historical deposition of Hg or industrial pollutions. Feng et al. (2004) measured soil Hg fluxes in Guiyang city and demonstrate that soil Hg emission could be a significant contributor to the local atmospheric Hg budget. However, the seasonal TGM variation in Guiyang did not exhibit summer maximum. And I also noticed some other inland cities including Chongqing and Beijing showed maximum TGM in winter. So, what is the difference between Nanjing city and other cities mentioned above?

Re: Yes, natural emissions in urban areas mostly come from historical deposition of industrial pollutions and its importance can't be neglected. Moreover, we think the difference between Nanjing and other cities in China which are mentioned in the comments is the seasonal variation of coal burning, which was also discussed in Section 3.2.1. As we know from those papers which showed winter maximum in Guiyang such as Feng, 2004, Liu et al., 2011, (referred in our paper) and other places such as Fu et al., 2008, 2010, domestic heating increases coal combustion sharply which there in winter will emission much more mercury to atmosphere than that in summer. But as the subtropical climate in Nanjing, we didn't have the heating period in winter. So the coal combustion is almost constant all the year, then the increasing emission of natural source will make a great contribution for the increasing TGM in summer. For Beijing and Chongqing which are mentioned in the comment, we also noticed some papers showed the measurement results there. We found different measurements showed different seasonal variation. For example, Yang et al., 2009 reported monthly variations in Chongqing with highest in November and lowest values in August. In the contrary, Li et al., 2010 measured TGM in Chongqing showed higher concentrations in summer. However, their results for Chongqing and Beijing came from discontinuous or short-term measurements. We don't think the results can show us an exact seasonal variation.

Q: Secondly, have the authors examined the relations between city predominant wind and seasonal TGM cycles. If the sampling site was located downwind of industrial sources, it may be possible that the summer maximum was resulted from industrial sources. For the TGM/CO ratios in winter and summer, it is not very clear whether they were directly related to natural and anthropogenic sources. Plumes from coal power plants in general have very high TGM/CO ratio, but some other sources like non-ferrous activities, small boilers, vehicles, etc. may have much lower TGM/CO ratios. If the site in summer were affected by the combined effect of many kinds of sources, the less pronounced correlation between TGM and CO should be expected. I think the authors should convince me by more discussions. The sampling site was close to a major road,

did the emissions of vehicles affected a lot to the observations?

Re: We have examined city predominant wind in Nanjing and found the wind from east (30.67%) and southeast (19.42%) are predominant in summer. Moreover, the east and southeast of our site is Mt. Zijin which is the largest mountain area in Nanjing city with the highest attitude of 448.9m. So, we think the natural emissions from soil and vegetation are important for the maximum in summer for Nanjing city. Surely, anthropogenic sources also will make some attribution to the concentration of TGM in summer as the coal combustion keep almost constant all the year in Nanjing. Besides, we don't think TGM from vehicles affected a lot to the variation because the emission of TGM from vehicles is very limited and our site is on the top of a high building which is 79m above the street (described in Section 2.1).

Q: What kind of sampling tube did you use, how long was it? Are you sure that your measurement of mercury contains all the RGM portions as you mentioned that the measured atmospheric mercury was TGM. Did you make a precision test for the GEM measurement? If not, you should not declare your accuracy of 5% in this study because instrument and field environment are quite different in some studies.

Re: We used Teflon tube to sample and the tube is about 2m long. Tests our group has done showed that RGM is not sticky and is not lost on tubing etc. As a matter of fact, it's very difficult to remove from an air stream. So we believe our measurement of mercury contains almost all the RGM portions. Moreover, we think precision is determined by the variation around a known value and accuracy is how well we know the real value. Typically, new instruments like the one we used in this study have a precision of 5-10%. Accuracy for the time being can only be determined by syringe injections. The permeation oven in the instrument used gave very consistent results indicating that the accuracy was on the order of 5%. We did test at the Thompson Farm site in US.

Q: Figure 15 is not clear enough, and it is better to present a colorful digraph.

Re: OK. We have changed Figure 15 to a colorful one which is following.

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 25037, 2012.

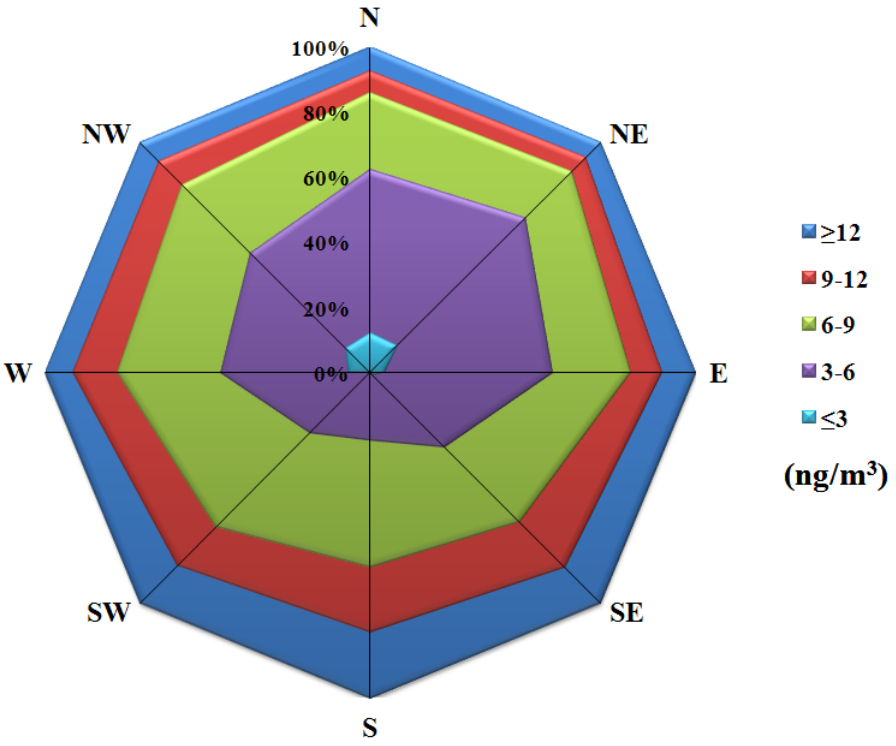

Fig. 1.