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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Quantitative assessment of upstream source influences on total gaseous mercury observations in Ontario, Canada" *by* D. Wen et al.

Anonymous Referee #2

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General comments: 1. In this paper, a modified STILT model is used to predict ambient TGM concentrations at three sites in North America. The result shows that the modified STILT model could better illustrate the near-field influences compared to CMAQ model. I noticed that the three sites, at which comparisons were made, are all remote sites. Are there some nearby sources (in the sub-grid scale) at one or two sites? I wonder why the authors chose these sites. If the authors want to show the model's ability to account for influence of nearby sources, I think at least one site which is affected by nearby sources (e.g. industrial or urban site) in the sub-grid scale should be used here.

2. I am not very clear about the definition of 'background only' in line 1 on page 28766.

If I understand correctly, this means the emission of Hg in North America is defined as zero. However, a very low average contribution (about 12%) from both natural and anthropogenic emissions in North America was calculated. This value seems much lower compared to previous modeling. For example, Seigneur et al. (2004) predicted that about Hg emissions from North America contributed about 30% of the total depositions of Hg in United States. Although there might be some difference between ambient TGM concentrations and Hg depositions, I still think the contribution of Hg emissions from North America is somewhat underestimated.

3. In section 3.3, the authors show that natural emission played a more pronounce role in the distribution of ambient TGM. It is generally believed that natural emission is positively correlated with solar radiation, soil temperature and moisture, etc. . ., and generally shows much elevated values during daytime and warm season. Are the TGM concentrations at the three sites were elevated in warm seasons and daytime compared to cold seasons and nighttime, respectively.

4. In Figure 3 and Figure 4, predicted TGM concentrations are generally higher and/or comparable compared to observed TGM concentrations in warm seasons (May and July); whereas predicted TGM concentrations are generally higher and/or comparable to observed concentrations. Please explain.

5. Two high-TGM events at Egbert in Feb, 2002 were not captured by the model. Besides, there are also several sharp decreases in TGM concentrations at Burnt Island in July, 2002. Do they imply chemical and or physical transformations between GEM and other forms or other atmospheric processes which were not taken into account in the STILT model?

Interactive comment on Atmos. Chem. Phys. Discuss., 10, 28755, 2010.