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Atmospheric Chemistry and Physics Discussions

Interactive comment on "An assessment of atmospheric mercury in the Community Multiscale Air Quality (CMAQ) model" *by* T. Holloway et al.

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Dear Dr. Holloway and co-authors,

This work raises awareness about some potentially important deficiencies in the modeling of oxidized Hg. You show that CMAQ-Hg has a high (>200%) bias for RGM and PHg. Recent work has also shown that GEOS-Chem and GRAHM, both global Hg models, greatly overestimate RGM and PHg. However, for both GEOS-Chem and GRAHM it has been shown that including in-plume reduction of Hg(II) to Hg(0) dramatically decreases the model's high bias for RGM and PHg (Amos et al., 2012, ACP; Y. Zhang et al., 2012, ACPD; Kos et al., 2011, oral presentation at by Dr. Ashu Dastoor at ICMGP in Halifax, Nova Scotia). Earlier modeling studies from Seigneur et al. (2003, Sci. Tot. Env.; 2006, JGR) and Lohman et al. (2006, ES&T) provide additional

support for in-plume reduction and Vijayaraghavan et al. (2008, JGR) has shown that the inclusion of in-plume reduction improves the performance of CMAQ-Hg. Have you considered including in-plume reduction in your CMAQ-Hg simulations? (The importance of in-plume reduction is a question also raised by Referee #1.) It seems possible that this could be an alternative explanation for your results and that the inclusion of in-plume reduction in CMAQ-Hg could change how important background Hg (i.e. Hg outside the GLR domain) is at DL and MKE.

I'm also curious about your hypothesis that RGM dry deposition rates are too high in CMAQ-Hg. Lowering the dry deposition rate of RGM would exacerbate the high bias in RGM concentrations. What is the range of RGM dry deposition rate you find in CMAQ-Hg at DL and MKE? And how do they compare to previous estimates from observations and models?

Interactive comment on Atmos. Chem. Phys. Discuss., 12, 2131, 2012.