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Atmospheric Chemistry and Physics Discussions

Interactive comment on "Air-snowpack exchange of bromine, ozone and mercury in the springtime Arctic simulated by the 1-D model PHANTAS – Part 2: Mercury and its speciation" *by* K. Toyota et al.

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In the construction of a mercury chemical mechanism for PHANTAS, it was intended to adopt the rate constant for the gas-phase reaction HgBr + Br from Goodsite et al. (2004), viz. $k = 2.5 \times 10^{-10}(T/300)^{-0.57}$ cm^3 molec.$^{-1}$ s^{-1}. The same rate constant was re-used for a more hypothetical reaction HgBr + BrO. However, a number that is 100 times smaller than reported in the cited study, viz. $k = 2.5 \times 10^{-12}(T/300)^{-0.57}$ cm^3 molec.$^{-1}$ s^{-1}, was mistakenly hand-copied to an input file for model runs. The paper currently under review in ACPD also presented this wrongly-copied rate constant in the list of reactions (see Table 1).

By redoing the model runs with the correct rate constant for HgBr + Br form Goodsite et al. (2004), we find that the role of this reaction was overstated in the sensitivity study on gas-phase mechanism of mercury oxidation presented in Section 3.4 of our ACPD manuscript.

Therefore we have decided to redesign the selection of scenarios in that section. Peterson and co-workers (Balabanov et al., 2005; Shepler et al., 2007) calculated the rate coefficients for HgBr + Br → $HgBr_2$, Hg + Br + M → HgBr + M and HgBr + M → Hg + Br + M by using different types of quantum mechanics theory than those employed by Goodsite et al. (2004, 2012). In the revised manuscript, Section 3.4 will be rewritten by using results from new model runs with a different combination of reaction rate constants from these studies. A tentative analysis of the new model runs can be found in the supplement to this post.

We apologize the editor, referees and readers (if any) of our paper for wasting their time by our simple mistake.

Please also note the supplement to this comment:
http://www.atmos-chem-phys-discuss.net/13/C10967/2014/acpd-13-C10967-2014-supplement.pdf

Interactive comment on Atmos. Chem. Phys. Discuss., 13, 22151, 2013.