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Atmospheric Chemistry and Physics Discussions

Interactive comment on "An evaluation of ozone dry deposition in global scale chemistry climate models" *by* C. Hardacre et al.

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Reply to Reviewer 1 comments

Comment 1:
"Page 22795, line 2: also add Tai, A.P.K., M. val Martin, C.L. Heald (2014), Nature Climate Change, doi:10.1038/nclimate2317 C7657 ACPD 14, C7657–C7658, 2014"

Reply to Comment 1:
We have added this reference as suggested.

Comment 2:
"Page 22797, line 21: what about the other models, which approach do they use? Identify in Table 1 which models use Wesely. Note that the CAM-Chem model has since HTAP been updated (Val Martin, M., C.L. Heald, S.R. Arnold (2014), Coupling dry deposition to vegetation phenology in the Community Earth System Model (CESM): Implications for the simulation of surface O3, Geophys. Res. Lett., 41, doi:10.1002/2014GL059651)"

Reply to Comment 2:
We have amended Table 1 to include the dry deposition scheme that was used in the model and the number of land cover classes included in the model. We have included a more detailed table in the supplementary information that details the land cover classes and provides extra references for models that have modified their dry deposition scheme from the original Wesely scheme. We acknowledge in the paper that, as for CAM-Chem, models may have undergone further development since this time (Introduction, para. 6). However, recent developments such as these do not influence the results contributed to the TF-HTAP study that we analyse here.

Comment 3:
"Page 22798, lines 11-20: I don't quite understand why the normalization is done using a constant 3 ppbv instead of the model surface ozone (which is used in Figures 6 and 7). Please explain rationale."

Reply to Comment 3:
We "normalised" dry deposition fluxes using constant ozone of 30 ppbv (approximately the global average surface ozone concentration) to remove differences in dry deposition driven by model differences in surface ozone concentration. This method allowed us to compare dry deposition rates for different models and different geographical regions independent of modelled surface ozone concentrations. However, we have

now modified this analysis to show dry deposition velocity rather than normalised fluxes in Figures 1 (d–f), 2 (e–h), 3, 4 (c–d), 5 (c–d), 6(b, e, h), 7 (b, e) and 8 (b, e). The deposition velocity is directly proportional to the normalized flux, so our conclusions are unaffected, and is a more physical quantity. Note that the deposition velocities simulated by the models are not available from the HTAP results, but are inferred from the dry deposition fluxes and surface ozone concentrations for each model.

Comment 4:
"Page 22800, line 10: could you identify how many models were similar with those studies?"

Reply to Comment 4:
We have included short statements (Section 3.1, Para2. Approx. Page 22800, L10-20) noting how many models were similar in the comparisons made by Wild et al., 2007 and Stevenson et al., 2006 and Young et al., 2013.

Interactive comment on Atmos. Chem. Phys. Discuss., 14, 22793, 2014.