

Interactive comment on “Influences of oceanic ozone deposition on tropospheric photochemistry” by Ryan J. Pound et al.

Anonymous Referee #1

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This paper implements a new process-based scheme for ozone dry deposition to the ocean based on the work of Luhar et al. (2017, 2018) into the widely-used GEOS-Chem model. The impact of this implementation on parameters pertaining to tropospheric photochemistry, such as tropospheric ozone and its budget, methane life time and OH burden, is reported. The sensitivity of the new scheme to the O₃-I reaction rate constant is also highlighted. It is shown that on average there is a significant improvement in the modelled ozone compared to measurements when the new oceanic deposition scheme is used in place of the default Wesely scheme.

Overall, the paper is interesting, well written, and is suitable for publication in ACP subject to the following, largely minor, comments:

1. In Section 3.2 and Fig. 4, the modelled deposition velocities are compared with the

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data from Helmig et al. It is not clear how they are matched in space and time. Please provide some details. What was the temporal resolution of the model output for v_d that was used in the comparison with the data?

Following on from the above point, if an appropriate temporal resolution (e.g. hourly) model output for v_d is available, perhaps it will also be useful to plot v_d vs. wind speed from the model and compare with the corresponding data plot in Helmig et al. (their Fig. 5, solid lines).

2. Table 1. 25th and 75th percentiles are given. It is not clear as to over what kind of sample size/properties (e.g. based on hourly or monthly modelled values?) these statistics are calculated?

3. Page 4, last para: I think another point of difference between the present model and that used by Luhar et al. (2018) is that the former includes halogen chemistry. Perhaps this should be mentioned.

4. Abstract, line 13: 112 Tg yr⁻¹. In Table 1, it is given as 122 Tg yr⁻¹.

5. Page 2, line 19: Generally, in addition to chemical or biological destruction, rc can also include physical loss at the surface.

6. Page 3, line 13: ‘second kind order’ to ‘second kind with order’.

7. Page 3, line 27: ‘3-D chemical’ to ‘3-D global chemical’.

8. Eq. 3: The functions \sinh and \cosh are usually not italicised.

9. Page 4, line 10: Give the unit of SST (K or deg. C) used in the parametrisation equations.

10. Page 5, line 25: I think ‘table 1’ should be ‘table 2’.

11. Page 5, line 25 and elsewhere: Luhar et al.’s global deposition value is presented. It would be useful to also present the uncertainty they calculated, i.e. 722 ± 87.3 Tg

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yr-1.

12. Page 6, line 5: 'it' to 'in'.

13. Page 6, line 17: Put spaces around 'and' and no italics.

14. Page 7, lines 18-19: You could also highlight that the largest increases are in the extra tropics and they are more pronounced in the Southern Hemisphere.

15. Table 2: What year(s) do these values correspond to?

16. Table 3. What year(s) do these values correspond to?

17. Figure 3. Please put year (2014?) in the caption. The same for Figs. 7–9.

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