Authors response to Anonymous Referee #2 comments

1. *Resolution Dependence: The simulations in this work are completed at 2°x2.5° globally. Dry deposition is highly dependent on environmental conditions that vary in their distribution at higher spatial resolutions. It's not immediately clear from the text that the performance assessment in this work would be consistent at higher model resolutions. Do the authors expect their implementation to be a similar improvement at all relevant spatial resolutions, or are these results unique to 2°x2.5°?*

Response: We do not believe there is any resolution dependence in this calculation of deposition velocity and results at higher resolutions would still be comparable to those we achieved at 2°x2.5°. The following addition has been made to the paper to address this

"*Whilst 2°x2.5° is a relatively coarse model resolution, we don't believe that there is any significant sub-grid scale correlation between tropospheric ozone concentration and sea-surface I^- concentration therefore this should not result in a resolution dependence*"

2. *Computational Expense: A major advantage of the simplified fixed surface resistance is the associated light computational burden in calculating deposition velocities. It would be useful if the authors could comment on the additional computational expense (if any) of their improved simulated deposition velocities.*

Response: We agree that the simplified method for calculating rc would have a light computational burden. The nature of dry deposition calculation this would be negligible with respect to the rest of the model and have made an addition to the paper to state this. We do not have appropriate diagnostics to provide a quantitative statement on the additional burden.

"*Any additional computational expense of implementing this improved r_c calculation will be small as the deposition velocity calculation remains a two dimensional problem, unlike the chemistry or transport calculations which are three dimensional problems.*"

3. *Additional Species: The parameterization presented here is likely to be relevant and useful to the simulation of species other than just ozone. It would be valuable to the broader community if the authors could comment on what would be necessary to extend this analysis to other chemical species, and potentially what the impact on those species would be.*

Response: We agree with the reviewers comment that mention of how to apply this deposition scheme to other species and what would be required to do so would be a useful addition to the discussion made in this paper. The following addition has been made to the paper.

"*It would be possible to apply this method of calculating r_C to other chemical species. If the appropriate sink processes were understood, chemical kinetics available, and concentrations of reactant species known. For this to be useful, the species would need to have a high dependence on r_C (rather than the physical resistances), but also for dry deposition to form a substantial part of the species budget. It is not clear whether any species, other than O_3, would meet these requirements.*"

4. *Eq 1: In the atmospheric science literature, dry deposition velocities are typically written with respect to the atmosphere (e.g. F = -V d * C). The sign in this equation is unclear with respect to the reference frame of the deposition.*

Response: The in text description of equation 1 does describe the direction of the flux as towards the surface but as commented by the referee equation 1 is inconsistent with this.

The formula for equation 1 has been updated to correctly reflect this.

$$F = -v_d C$$

5. *P6 L26: The labels k and a are inconsistent between the text and Figure 5, which uses full name descriptions. This adds confusion for the reader.*

Response: The figure caption for figure 5 has been updated to give the labels for each of the full name descriptions and wording of the caption updated to address this comment and comment 6.

6. *Figure 5: Why are all panels a function of temperature except for "Water side friction velocity"? Is the Water side friction velocity also binned by temperature?*

Response: As the referee's comment states the figure caption was misleading and this has been updated to correctly state that all functions are binned by temperature apart from water side friction velocity which is binned by friction velocity. The caption now reads

"*Figure 5. The response of deposition velocity to the variation of only a single parameter with other parameters set to global average values. Sea-surface iodide concentration [I −], rate coefficient k, diffusivity D and solubility α are produced from global values averaged into 1 K temperature bins. Water side friction velocity u ∗ w is averaged into 0.1 m s−1 friction velocity bins.*"

7. *Figure 6 & Figure 9: What do the shaded regions in the figure represent?*

Response: For both figure 6 and figure 9 the captions have been updated to state that this shaded region represents the 25th to 75th percentile range.

8. *P2 L21: "Gases that are highly soluble giving them a small r c ". This sentence is confusing as written.*

Response: We agree that the wording of this sentence could be confusing so this sentence has been reworded and now reads

"*Gases that are highly soluble (such as sulfur dioxide) will have a small rc, so their limiting factors are the atmospheric resistances (ra and rb)***"**

9. *P3 L10: "(the product of ..." the parenthesis in this section appear to be off.*

Response: The surplus parenthesis in this sentence has been removed such that the sentence now reads as intended

"...*(the product of [I−] and the second order rate-coefficient, k)...***"**

10. *P6 L17: "Dandα" authors likely meant "D and α"*

Response: Corrected typo, removing 'and' from math mode such that it is now correctly spaced and no longer italicised. Sentence now reads **"**...,k,D and α.**"**