

We thank very much for the helpful comments and suggestions from the reviewer, which help us improve our manuscript. This round of author responses to review comments are shown in red text.

This reviewer found the difference between Lombardozzi et al. (2013) and Lombardozzi et al. (2015) to be confusing, since the latter simply presented a table of coefficients “based on Lombardozzi et al. (2013)” without pointing out and reconciling the differences. The present study’s authors may believe that it should not be their responsibility to reconcile such differences, and they simply applied Lombardozzi et al. (2015)’s values. The fact that previous studies applied those values without questioning does not justify the inconsistencies. Notwithstanding, I believe that the authors’ making it perfectly clear that those ac, ap, bc, bp values were actually from Lombardozzi et al. (2015) could probably help draw the community’s attention to such confusing discrepancies. Therefore, I appreciate the authors’ addition of such information.

Response: Thank you for your understanding. We have made it clear in the text that the coefficients we used for L2013 scheme were adopted from Lombardozzi et al. (2015).

The authors did not understand my comment. In their response to my 1st round of review, they stated, “The leaf-level CUO (mmol m⁻²) is calculated by accumulating stomatal O₃ fluxes of Equation 4 from the start of the growing season to the specific time step”. That means that the authors integrated Eq. 4 from the very first timestep, which I assume would be about 160 seconds, up to each ensuing timestep. Logically, all the simulations before the 8th simulation day should not be using Eqs. 5 and 6 to calculate O₃ damage ratios, simply because the duration was too short for the equations to be applicable. This logically led to the fact that the integrated stomatal ozone flux amounts > 7 days were in fact built upon erroneous initial values. That is why I’ve been skeptical of the applicability of L2013 in their modeling coupling exercise from the very beginning.

Response: The reviewer may have some misunderstandings of the calculation of CUO. The criterion of “> 7 days” was used only in the selection of valid observational samples, because it allowed certain period of O₃ fumigation so that the symptoms of damages were more significant in the statistics. As for the calculation of CUO, it should be accumulated at the very beginning of the growing season. For example, the words from Lombardozzi et al. (2015) stated that: “CUO only accumulates during the growing season”. We checked through L2015 paper and did not find any restrictions of CUO calculation for the first 7 days. In our simulation, we accumulated CUO from May 1st but removed the results of the first month, assuming that the O₃ fumigation was not long enough to derive the damages. We applied Equations (5) and (6) for the CUO of June-August, consistent with the way how these equations were derived.

Comparing the three-month averages of O₃ damage using S2007 and L2013 does not make sense to me. S2007 calculates instantaneous values, while L2013 simulates

incremental ozone damage. The three-month average of S2007-calculated ozone damage shows the average ozone damage resulting from the amount of ozone exposure within that hour. The three-month average of L2013-calculated ozone damage shows the ozone damage due to ozone exposure averaged from over time periods from one week to three months. In this reviewer's opinion, they're comparing two completely different parameters!

Response: We agree that L2013 and S2007 schemes were based on different mechanisms. The L2013 depends on the accumulated O₃ fluxes while S2007 relied on the instantaneous O₃ fluxes. It was not our focus (and of course out of our capability) to determine which scheme was correct, because both of them had been derived or validated against many observations and had been widely used in previous modeling researches. The novelty of this study was to show how different these two schemes, and the consequent climatic feedbacks due to these discrepancies in O₃ damage schemes. From this perspective, we have to retain the original equations and procedures of calculations from L2013/L2015 and S2007 without artificial alterations.

Reference:

- Lombardozi, D., Sparks, J. P., and Bonan, G.: Integrating O₃ influences on terrestrial processes: photosynthetic and stomatal response data available for regional and global modeling, *Biogeosciences*, 10, 6815–6831, <https://doi:10.5194/bg-10-6815-2013>, 2013.
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- Sitch, S., Cox, P. M., Collins, W. J., and Huntingford, C.: Indirect radiative forcing of climate change through ozone effects on the land-carbon sink, *Nature*, 448, 791–794, <https://doi.org/10.1038/nature06059>, 2007.