

Interactive comment on “Predicting photosynthesis and transpiration responses to ozone: decoupling modeled photosynthesis and stomatal conductance” by D. Lombardozzi et al.

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Comment 1. The effects of ozone are specific to each species. How much better is this modeling approach compared to models with more species information? There could be more discussion of this topic.

Author response: The differences in species responses to O₃ exposure are important to include in model simulations. However, data is not always widely available for many types of species. We have included a paragraph in the discussion section (starting at line 6 on page 30) that discusses the availability of data for use in models.

Comment 2. It is important to make it clear to the reader that the modeling modifications
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tested are based on tulip poplar seedlings. Tulip poplar is only mentioned once at the very end of the methods section. Similarly, it should also be made clear throughout the manuscript that the simulations were run at a constant high ozone exposure of 100ppb. These two pieces of information should be included in the abstract. It also should be noted that tulip poplar data is presented in the figures and the tables (for example table 1 & Figure 2). Tulip poplar should also be mentioned on page 4261 line 10 “observed tulip poplar conductance values” and page 4262 line 13.

Author response: The text has been updated to include the fact that the simulations were based on responses of tulip poplar and that CLM simulations were run at a constant 100 ppb O₃. This information is now included in the abstract (p.2, lines 10-11 & 14), introduction (p.7, lines 12 & 19) methods (p.9, line20; p.11, lines 1 & 12; p.12, line 9; p.13, line 15; p.16, line 5), results (p.16, line 15; p.17, lines 5 & 12), and discussion (p. 22, lines 8 & 17; p. 23, line 18). The Figure 2 and Table 1 legends have also been updated to note that observed values are measured in tulip poplar.

Comment 3. I am a little skeptical of taking the modified model parameters and jumping right to a global model. However, the authors correctly point out similar previous studies present model results at the regional and global scale. There is some discussion of the 5 x 5 grid cell that is centered on Ithaca, NY, where the model modifications were developed. It might have been more reasonable to expand from that grid cell to the range of tulip poplar in the US. This sort of regional and species specific modeling has been done by Weinstien et al (2001) and Laurence et al (2001) using the coupled TREGRO and ZELIG models. The authors could also use EPA ozone monitoring data in the tulip poplar range to make a more realistic exposure scenario for comparison with the 100 ppb exposure scenario.

Author response: The primary objective of this work was to test whether stomatal responses to O₃ could be incorporated into models independently of photosynthetic responses. Using a high [O₃] and a single plant type allows us to more clearly determine whether this objective is met because all plants are responding the same way to the

same O₃ exposure. Additionally, using this data in a global model allows us to identify hotspots where O₃ damage might have a large impact on GPP and transpiration, helping to direct future research efforts. Both of these points are now included in the text of the introduction (p. 7, lines 20-23; p. 8, lines 1-3). We have also included a paragraph discussing the current availability of data for use in models.

Comment 4. The authors may want to cite Gregg et al (2006) for another example of the decoupled response of photosynthesis and conductance to ozone exposure.

Author response: The Gregg et al. (2006) manuscript is now included as an example of photosynthesis and stomatal conductance decoupling in response to O₃ exposure.

Technical correction: -Equation 5, on page 4252, Line 10: "gs" is defined as leaf stomatal resistance. In equation 2 "gs" is defined as stomatal conductance. Equation 5 should probably be changed to avoid confusion.

Author response: The variable name for stomatal resistance is now changed to rs to distinguish from stomatal conductance in the previous equation.

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