

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

**Anonymous Referee #2**

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This manuscript continues previous work to address the issue of ozone exposure affecting leaf photosynthesis and conductance differentially and how this can be addressed through modifications to the Farquhar/Ball-Berry model. Specifically, the authors consider the implications of these effects when taken into account in a terrestrial ecosystem model. This issue is critical to understanding how ozone pollution may affect productivity and water cycling in terrestrial ecosystems. The modifications of the photosynthesis model were based on tulip poplar seedlings exposed to ambient and elevated ozone during a 16-week experiment using open top chambers. The field measurements and much of the modifications to the photosynthesis model are presented in a previous paper Lombardozzi et al 2012.

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This manuscript is generally well written, organized and presented. The paper should be published with minor revisions. My comments and suggestions are below:

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.

2. It is important to make it clear to the reader that the modeling modifications 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.

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.

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.

Technical Correction:

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-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.

#### REFERENCES

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Gregg, J.; Jones, C.; Dawson, T. (2006). Physiological and developmental effects of O<sub>3</sub> on cottonwood growth in urban and rural sites. *Ecological Applications*, 16(6), 2368-2381.

Weinstein, D.A., Gollands, B., Retzlaff, W.A., 2001. The effects of ozone on a lower slope forest of the Great Smoky Mountain National Park: simulations linking an individual tree model to a stand model. *For. Sci.* 47 (1), 29–42.

Laurence, J.A., Retzlaff, W.A., Kern, J.S., Lee, E.H., Hogsett, W.E., Weinstein, D.A., 2001. Predicting the regional impact of ozone and precipitation on the growth of loblolly pine and yellow poplar using linked TREGRO and ZELIG models. *For. Ecol. Mgmt.* 146 (1–3), 251–267.

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