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Biogeosciences Discussions

Interactive comment on "Evaluation of simulated biomass damage in forest ecosystems induced by ozone against observation-based estimates" *by* Martina Franz et al.

Anonymous Referee #1

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Using the O-CN vegetation model as a testbed, the authors specifically tested four ozone damage functions in terms of simulated biomass reduction against measured ozone dose-biomass response data across Europe and finally derived tuned damage functions that can much better simulate the biomass responses.

This work is a very well-designed modelling study. Modelling protocols and results are clearly presented. Overall this manuscript is very well written and easy to follow most of the time, which should be accepted for formal publication after a minor revision.

However, I do have a few questions that may need the authors to further clarify:

1)The authors assume that the modelled accumulation of ozone fluxes at the top

canopy layer equals POD during the model-observation comparison process. Please justify this assumption. I think this is important for the evaluation of model against observation, considering the ozone damage is explicitly calculated through the canopy and integrated to derive the whole tree damage. The modelled POD value largely influences the slope of the resultant dose-response curve and its distance with observed dose-response curve. I am wondering how would the authors account for this treatment in influencing the evaluation of different algorithms against observed data.

2) I am curious why did not the author try to use different damage functions at different depth of the canopy?

3) Another important, but still largely missing, aspect in simulating ozone impacts on vegetation is the huge diversity of species-sensitivity in an ecosystem. Dealing with vegetation to the PFT level is not enough, though totally make sense in terms of large scale modelling and data scarcity. This work could be improved by further talking about diversity of species response to ozone. To this end, I found the following work could be a good reference: Wang, B. et al. Forests and ozone: productivity, carbon storage, and feedbacks. Sci. Rep. 6, 22133; doi: 10.1038/srep22133 (2016)

This study, though without sophisticated ozone damage simulation, had an explicit simulation of species sensitivity to ozone using an individual-based model and found dampened responses to ozone over long-term simulations. Minor comments

L27 on page 4: please justify the statement of highest N concentration at the top of the canopy and its exponential decline with increasing canopy depth.

L18 on page 5: in equation 2, how is the stomatal conductance of O3 calculated?

L28 on page 8: identical -> identically.

L5-6 on Page 18: this sentence should be restructured to make it easier to follow.

L7 on page 18: ''all in all' should be followed a comma.