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EGU

Interactive comment on "Low sensitivity of gross primary production to elevated CO_2 in a mature Eucalypt woodland" *by* Jinyan Yang et al.

Anonymous Referee #2

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This manuscript syntheses a large amount of data from the EucFACE project to examine the effects of Rubisco- versus RuBP limitation on photosynthesis under elevated CO2. The authors present leaf-level measurements, leaf-level modeling, and canopy scale modeling of ambient versus elevated CO2 conditions to illustrate that current projections of GPP under elevated CO2 are overestimated in mature forests due to biases towards light-saturated leaves. This work is scientifically relevant and pedantic. I want to commend the authors on their efforts and have minor suggestions to improve the presentation and make the work clearer to a wider audience.

The introduction is extremely well written and provides appropriate context for the work being conducted within the manuscript. The methodology is thoughtfully presented, and justification was given for parameter choices in the model. The amount of data

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used to represent the system is commendable and I appreciate the attention to detail. I find the presentation of soil moisture to be the weakest element of the methodology and would recommend a little more attention paid to it as it is one of the few varying parameters between the replicates. The presentation of the results would be strengthened by more clearly delineating measurements vs. leaf scale modeling vs. canopy scale modeling. I would personally be very interested in seeing some of the rawer data forms (e.g., timeseries of canopy model) in addition to the synthesized percent changes. While this may be a question of style, I found the figure captions to contain relevant information that was missing from the text. I would include more of that information in the text for clarity. Figures are adequate, but the figure legends are not descriptive (esp. Fig 2 and 4-7) and the long captions make it difficult to distinguish between the different replicates, responses, etc.

Overall well done and I'm excited to see this work published!

INTRODUCTION L94 -95 Can you please give an example of the ranges of Jmax:Vmax ratio found in these cited works to show how much it deviates from the normally adopted ratio of 2?

METHODS L132: Is the repo unchanged or should the reader be directed to a certain commit version?

L162: You do not introduce the variable D until line 172 and do not provide units.

L164: Can you please clarify the choice between Jmax and Vcmax here in the Vmax, t parameter?

L175-177: I would introduce the equipment and measurement heights before the frequency, but this is a minor point.

L186: In Fig 2 you present that you use 150cm neutron probe measurements that were conducted biweekly and linearly interpolated, but here you say these measurements were not gap-filled? While I do not think this would majorly affect your results, averaging

the soil moisture over the entire 150 cm profile seems problematic as you are giving equal weight to regions that are likely to contain significantly less root biomass. Would it not be more fitting to use a weighted average based on the below-ground biomass distribution to represent the soil moisture that the tree actually "feels"? Would this have changed your g1?

L202: Minor point of convention – normally see DBH represented in [cm]. I assume you used DBH in [cm] in your allometry in Eq 4?

L214-215: Fit statistics of this allometry?

L225: No, no to citing an "in prep" when you seem to be presenting this data in this work.

L278 Misspelling of \theta_min

L246: Please expand up on the statement "within two weeks without rain" – was there some selection of points that happened based on this? I'm bit confused with the g1 and soil moisture match up.

L249: This is quite the range of leaf temperatures indeed!

L255: Missing commas.

RESULTS The results presentation is somewhat difficult to follow given the large number of simulations and measurements spanning scales. Figure 4's mix of bar and point measurements is difficult to follow. Separating data measurements from modeled responses could help the reader follow better what is derived from models and what was an actual measured response. I appreciate the color coding between leaf and canopy measurements. Also, making a clearer distinction between the leaf-level models using the R package and the canopy scaled measures made using MAESPA would be helpful.

DISCUSSION

L397-398: I would love to see the timeseries that illustrates this stomatal closure at the canopy scale.

L405-418: Ah ha! This was the presentation of J:V ratio ranges that I was waiting for. I would still suggest adding in a range to the introduction so that the reader is primed to consider how variability in J:V could impact these modeled responses to eCa.

L420: Yes, but would how would the way you averaged your soil moisture values affect this value?

L449-451 I agree with this statement, but can you be more clear about what "uncertainty" you are referring to? Are you talking about uncertainty in our forcing variables for models; structural uncertainty in the models; both?

L462-463 Falsify those model simulations? Should we just throw the models in the trash or can we focus on an improvement in the model structure in order to capture these transitions between Rubisco limitation and RuBP regeneration? Or could it be also that there are other structural differences between those models and the explicit canopy structure of MAESPA?

FIGURES

L708-711 Fig 2: You give no clear indication about what the different line colors mean. I assume these are replicates, but I am not clear about if these are elevated or control plots. You briefly mention ring numbers in text, but the figure would be improved if you make this distinction more visually apparent.

L714: "error bars represent standard error of fitted values" I'm a bit confused by this statement.

L717: This figure is especially hard to follow and the mix of bar and points is difficult. I would suggest adding further groups to help identify measurements vs. leaf scale modeling vs. canopy scale modeling.

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