Dear Referees,

before addressing the comments in detail, we would like to thank both reviewers for taking the time to point out the shortcomings of our manuscript and to provide possible solutions to them. We value the meticulous review of our study and genuinely appreciate the efforts to address each of the issues in detail. We believe that the suggested changes significantly improve the quality of the manuscript.

General Comment

It might be nice to include some discussion on how much including LT modifies global evapotranspiration and temperatures, broadly (in addition to carbon impacts)

We fully agree with the reviewer and will add figures similar to Fig. 11 for temperatures (i.e. leaf and air temperature) and evapotranspiration (in the form of latent heat flux) showing the difference between the experiment where photosynthesis is calculated as a function of leaf temperature and a reference run where it is calculated as a function of air temperature (as has been the case in the past).

Specific Comments

- Line 106: there are a lot of reasons that non-transpiring parts of the canopy (bark, branches/trunks) should be much hotter than transpiring leaves. Could the authors please include a discussion about if Tc here includes this and thus overestimates Tleaf, or if instead Tc really is Tleaf, and the canopy instead is estimated to all have leaf-like temperatures? (Just make it clear if CEBa is skipping the woody-bit or of Tleaf is including the T of woody-bits in this study)

  Thank you for pointing this out. We added the following sentence to make it more clear:

  "This means that leaf temperature could be overestimated in the case of high solar radiation by taking into account the non-transpiring woody parts. On the other hand, the greater heat capacity of the (moist) biomass of these parts could buffer extreme temperatures and counteract this effect."

- Line 149: because the authors mention snow, what *does* happen if there is snow on the ground? Is it effectively on "topöf the vegetation, or under the vegetation but on top of the ground?

  Snow evaporation (& sublimation) is included in the model, both from the canopy but also from the ground below. Here, the treatment of snow does not differ between the standard model and our CEBa setup, and – to keep the manuscript as simple a possible – we did not include the respective terms in the equations provided in the text. To clarify this, we included the following:

"In CEBa, evaporation of snow and interception water can occur either from the top of the vegetation or from the ground below the canopy. However, for simplicity reasons, snow and interception evaporation are not included in the latent heat flux equations given below, even though they are included in the respective formulations in the model."

- Line 165: Do the authors mean the RH of the air space in the top soil layer? (Pardon my ignorance here, soil moisture physics are not my strongest suite). Just clarifying that they're calculating RH of air in soil vs how saturated the soil is (i.e. measuring water as a gas vs a liquid).

  We have to agree with the reviewer that the description of relative humidity may not have been fully clear. We hope that this can be remedied by the following:

  "[...],and RH_g is the relative humidity of gaseous water vapor at the soil-air interface (just above the ground), which can be parameterized by a nonlinear function depending on the water content of the top soil layer"

- Line 248-249: Might be useful here to say how much area / how much of the time the land surface isn't experiencing any water stress.

  We agree that this is an important point and we would add a figure of a global map with the average (growing season) water stress in simulations with the CEBa scheme.

- Line 250: please give a brief explanation of the oasis effect here. (Authors do explain this near line 460, but this is the first place they mention it so it would be helpful to briefly sketch in words what it is).

  Here, we slightly extended the sentence to provide a (very) brief summary of the oasis effect and added a reference to a paper that provides a detailed description of this effect.

  "Above a certain temperature, the latent heat flux exceeds the net radiation at the surface of the leaf, resulting in the leaf absorbing energy from the surrounding air and the sensible heat flux becoming negative. This phenomenon is known as the oasis effect, which has also been found for vegetated canopies (Taha et al., 1991)."

- Figure 7: I assume the authors checked for all of the figure 7 cases that the negative relationship in figure 6 holds, but might be worth explicitly stating that (sorry if you did and I just missed it)

  No, you did not miss it. One could only see it indirectly from the negative y-axis on the right side of the subfigures in Figure 7, but to make it clearer, we've also highlighted it in the text. Thank you for pointing this out.

"The slope of the regression line (SRL) holds its negative relationship (as seen in Fig. 6) for all configurations of radiation and humidity. The absolute value of the negative SRL decreases with saturation (Fig. 7b) but increases with rising radiative fluxes (Fig 7a), indicating [...]"

- Figure 7: clarify in legend of (d) that RH = 20% and Sin = 1000 W/m2 (and so on for other colours)

  Thanks, we modified that in Fig. 7!

- Line 260: ie latent cooling isn't very effective when it is humid – it may be useful to reference Vargas Zepetello et al 2020. Specifically I'm thinking of figure 8 (showing changing LH has minimal effect when water flux is already large). They were more interested in soil moisture in that study, but the same general physics is at work as what I think the authors are getting at here - if you're already cooling a lot via latent cooling, and the atmosphere is really humid, it is hard to get "extra" cooling via the latent heat pathway. https://doi.org/10.1175/JCLI-D-19-0209.1

  We added the reference! Thanks for the suggestion of that interesting scientific study.

- Line 273: what do the authors mean by "vegetation period growing season?

  We agree that "growing seasonïs the better term and changed "vegetation period" to "growing season" throughout the manuscript