Response to Reviewers of 'Global and Regional Hydrological Impacts of Global Forest Expansion' by King et al.

We thank the reviewers of our manuscript for their detailed and constructive comments which we have used to improve the presentation of the work. Following the journal's requirements, we structure our responses to these comments by first showing the reviewer's comment, followed by our response, and then any changes we have made to the manuscript. The reviewers' comments are in italics, with our response in plain text. Text from the original manuscript is in blue, and is struck through where it has been removed; new text that has been added is in red.

Reviewer 1

The subject of this study is highly relevant and timely. Hydrological aspects of forestation have received less attention compared to carbon dynamics and albedo change, making this research particularly valuable. The study presents insightful results that advance the conversation on the role of forestation in climate change mitigation. The abstract and introduction are engaging and well-crafted, and the methods section appears sound. However, the quality of the manuscript declines significantly in the later sections. My primary concern is with the presentation of the results, while the discussion and conclusion sections also lack strength. Further details are provided in the following.

We are glad the reviewer appreciates the contribution we aim to make to the growing literature on forestation impacts, and acknowledge their positive comments on the scoping and methodology of our study. We appreciate constructive comments on how we can improve the presentation of the results along with the discussion and conclusions.

Abstract: I am wondering, if the higher water demand of forests compared to grass- or shrubland isn't partly compensated by the improved storage of water in forest ecosystems? Here are a few thoughts (that might also help the discussion section):

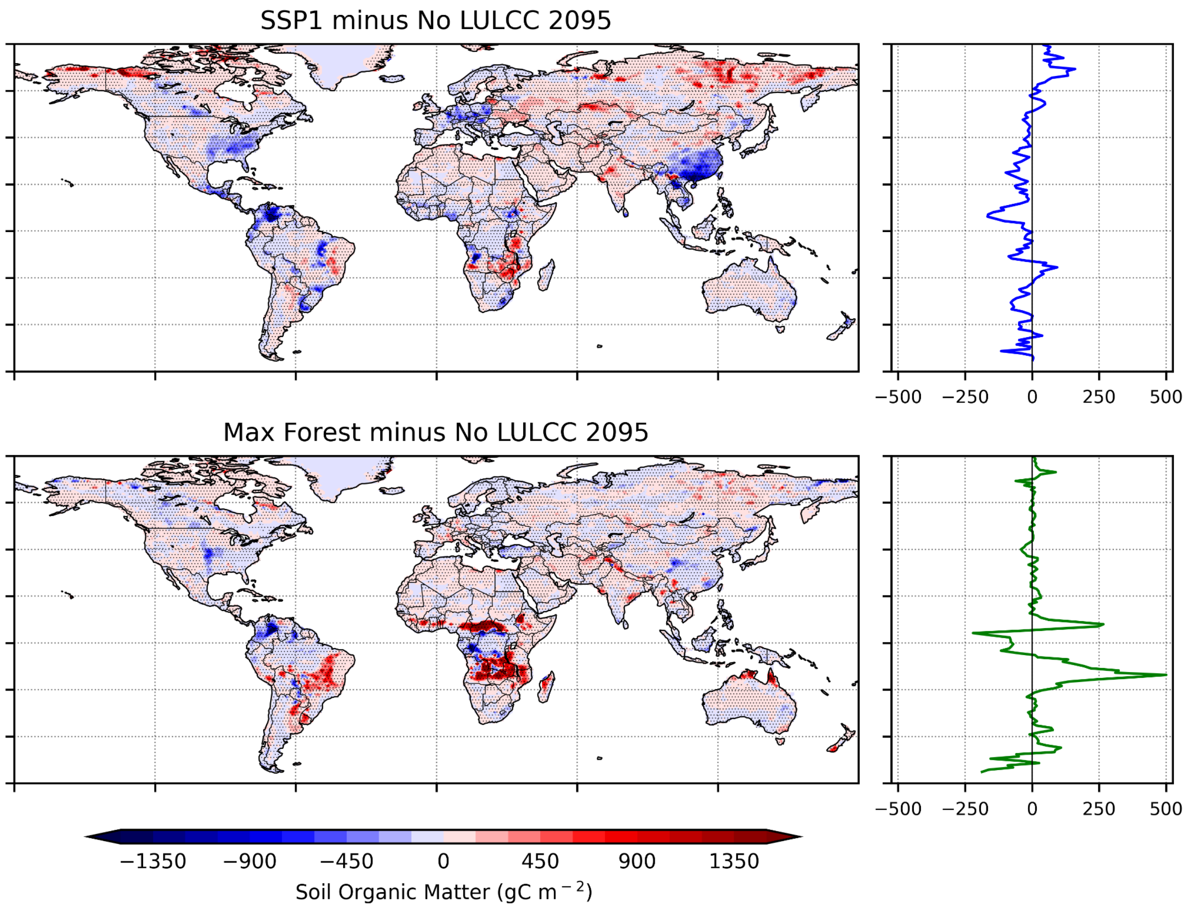
1. *Forest soils often have a higher organic matter content and more complex structure than grassland or shrubland soils. This can increase soil moisture retention and water infiltration rates.*

2. *Forests have deep and extensive root systems that help capture and store water deep in the soil. This can be especially beneficial during dry periods, as the roots can access stored water.*

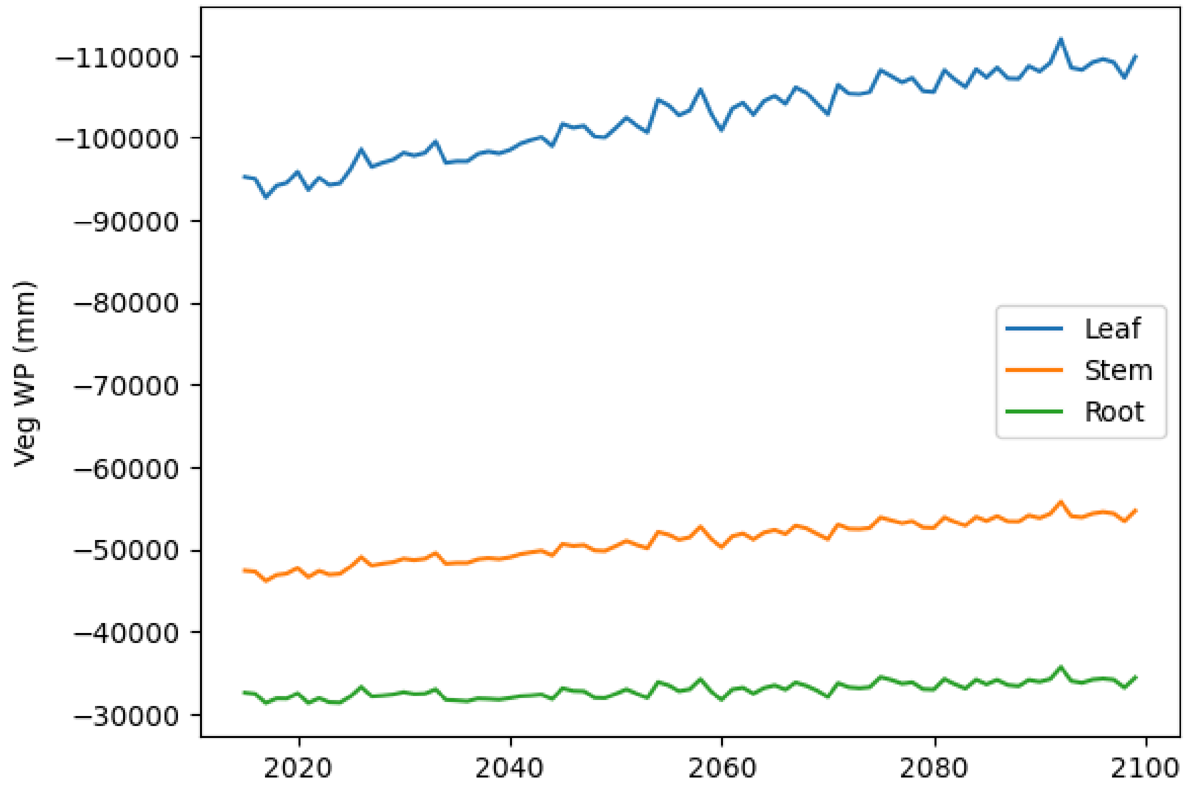
*3.	The forest floor's layer of leaf litter and organic matter can help retain moisture and slow down evaporation, contributing to the overall water storage capacity.*

*4.	The shade provided by forests can reduce evaporation rates compared to open grasslands or shrublands, allowing water to remain in the ecosystem for longer periods.*

We appreciate the points raised here on additional biophysical processes that result from expansion of forest cover. In our simulations, we find that soil organic matter is greater in the Max Forest scenario relative to the control, especially in areas where forests expand into grasslands and shrublands (e.g., margins of the Congo Basin, southern Brazil, northern Australia - see figure below). Therefore, the expected response of forest soils having higher organic matter content than grassland or shrubland soils is found in our results. This is especially the case given that the Max Forest scenario mainly achieves forest expansion at the expense of grasslands or shrublands because of the constraint on not expanding into agricultural land (at 2015 levels). However, we see less of a signal in soil infiltration, which is dominated globally by non-statistically significant differences across all latitudes when comparing Max Forest and SSP1 to the control, except notable increases in West Africa and the Congo Basin, but decreases in southeastern Brazil. We see less of a signal in the soil infiltration, which is dominated globally by non-statistically significant differences in the high northern latitudes when comparing Max Forest and SSP1 to the control. There are few significant differences in infiltration in the midlatitudes, with a mixture of increases and decreases in the tropics and subtropics; notably in Max Forest there is significantly higher infiltration in West Africa and the Congo Basin, but lower infiltration in southeastern Brazil compared to the control. This is related to rainfall characteristics as well as soil properties.



We agree that the root water storage is important in an ecosystem context and that tree roots have much greater storage potential than the grass roots they are largely replacing in the Max Forest scenario. However, our results show a decrease in soil moisture as well as an increase in plant water stress, and the total grid cell water storage, which includes vegetation as well as soil and surface water, is significantly lower in afforested areas. Combined with increasing transpiration, this suggests to us that the increasing water demand from plants is not compensated for by increasing plant water storage over the 85-year timescale of our model runs, especially given the limited trends in precipitation in the SSP1-2.6 warming scenario. Below, we show the contribution to the global mean plant water stress from each plant physiological component in the model for the Max Forest case, demonstrating that the water stress increases are dominated by the leaves while the root stress is less. Therefore, while root water storage does increase, plant water stress still increases (note that a more negative value indicates an increase).



The total grid cell water storage (the sum of canopy water, snow water, surface water, plant stored water, water in the soil, and water in the rivers) indicates widespread reductions in areas of expanded forest cover compared to the control, suggesting that any increases in tree root water storage do not offset the decreases in water storage elsewhere. We also show in fig. S9 that evaporation from the soil is reduced in Max Forest across all domains, which partially offsets the increase in transpiration to dampen the increase in total evapotranspiration. This is also mentioned in the discussion section (lines 506-509). However, considering the total grid cell water storage, we note that any increase in water storage within plants does not compensate for the loss in water from other parts of the system.

To summarise these points, we have added some extra detail to our discussion of the effects of reduced soil evaporation on total evapotranspiration, as well as on how well the model is able to represent the processes mentioned by the reviewer here.

Page 19, line 592:

Additional important land processes resulting from forestation include changes to soil organic matter, which is significantly increased in Max Forest compared to No LULCC as forest soils generally store more carbon than the grassland or shrubland soils they are replacing. While this might be expected to increase soil moisture retention, alongside the greater potential for plant water storage in tree roots compared to grasses, the total grid-cell water storage (not shown) is still lower in key forest expansion regions in Max Forest, showing the dominance of the largely leaf-level increases in water demand in driving total water availability. Changes to soil infiltration are limited and not uniform in direction in afforested regions, showing the importance of rainfall and background soil moisture, and we encourage evaluation of CLM5's ability to simulate the relationship between soil carbon and hydrology (e.g. Telteu et al. 2021), especially in the tropics, as a result of PFT-level change.

Introduction: Very well-written. The introduction nicely summarizes the current state of research and the research gaps that the authors aim to fill with this study.

Situating research within the wider context of current literature is key, and we are glad the reviewer finds we accomplished this.

l. 88 and 97 although most people reading this journal will know the definition of albedo and latent heat, I would add a short explanation (e.g., in parenthesis) as they are very important in the context of your study.

We have added definitions of these terms as follows.

Page 3, line 88:

These include the effect of the reduced albedo (i.e. the ratio of reflected to incident radiation) of trees when compared to other land cover types, such as cropland or grassland (Kirschbaum et al., 2011; Windisch et al., 2021).

Page 3, line 97:

At continental and hemispheric scales, increased moisture availability can drive changes to latent heating (i.e. energy released due to condensation of water vapour) that affect remote atmospheric dynamics (Laguë et al., 2021) including the general circulation of the atmosphere (Portmann et al., 2022).

Methods: I am not an expert for the methods used in this study, but the approach appears solid to me.

l. 160-162 you could also mention that you didn't account for any other disturbances (fire is not the only disturbance with global importance for climate regulating services)

We aim to be clear about the limitations of our study. Some disturbances, principally fire, were not considered here by design because they add complexity to the interpretation of the results and will be considered in future work where the methodology will be designed specifically to investigate them. Other disturbances relevant to biosphere-climate interactions, such as herbivory and disease, are not explicitly simulated by the model (Lawrence et al. 2019).

We have added some text to clarify, beginning at page 5, line 175:

We do not consider the role of fire in this study, nor other vegetation disturbances such as surface ozone damage, herbivory and diseases, as our aim is to isolate the hydrological impacts directly caused by forest expansion, rather than second-order feedbacks that could obscure the direct signals; herbivory and disease are not simulated explicitly by CLM5, while frost damage and heat stress are included implicitly in the model (Lawrence et al. 2019).~~as we aim here to isolate hydrological impacts directly caused by forest expansion, rather than from second-order feedbacks that may obscure the direct signals. Therefore, there is no active fire model used.~~

Figure 1: The figure is hard to read. Consider to move B below A and increase the fond sizes.

As suggested, we have increased the font sizes in Fig. 1 as well as other figures in the manuscript), and placed Fig. 1B below Fig. 1A. We have also increased the sizes of the figures in the review document; the full-size figure files for the final published version are very high-resolution which should also address this comment.

Results: In this section I see room for improvement. First, the result section should just focus on the outcome of the study. Currently, the results also contain parts that should be moved into the introduction, methods, or discussion sections. Second, the results provide lots of details, but a general overview is missing in the sections. I am wondering if this isn't too much detail as it distracts from the main message, but this is also related to my first point. Third, the figures are not well-designed and should be revised.

l. 222 It is just a stylistic note, but I would hope for a better start into the results section. First it would be nice to get an overview, and from there you can continue with the details.

We have added a sentence to page 8, line 245 to help introduce the results:

We first demonstrate that forest expansion can have direct climate change mitigation benefits by reducing surface temperatures. Figure 2 shows the effect of forestation on near-surface temperatures. In the Max Forest scenario, near-surface air temperatures in forested areas are on a global average 0.48°C cooler than the No LULCC and 0.38°C cooler than Base by the end of the 21st century.

l. 249 and elsewhere: Not sure, if "experiments" is a good term here. I would rather think about a manipulation or warming experiment. Maybe "simulation experiment" or just "simulation" would be clearer.

This is a fair point and we acknowledge that model simulations might be viewed as different to laboratory or field experiments. Within the context of a multidisciplinary journal such as this, we consider Earth System Models to be our experimental tools. The approach we took in this study aligns with generally-accepted understandings of the word 'experiment' in a scientific context, for example the comparison of a perturbed system to a control system, the use of replicates to account for uncertainties, and the use of clearly defined experimental protocols which are widely accepted within the research community. In the Earth System modelling community, model simulations with different forcings, (for example, different land use scenarios) are generally referred to as experiments, e.g. see the recent paper in this journal by Asaadi et al. (2024). To clarify that we refer to experiments performed by an Earth System Model, we have added the word "model" preceding "experiment", both here and throughout the manuscript.

Figs. 2B, 3, 7, 8: The legends and the letters insight the figures are very small. They don't have an x-axis label. Without reading the caption it isn't clear why there are these two dots per scenario what the letters mean. Overall, I don't feel these figures are well-designed. Think about improving them or changing them fundamentally. Moreover, I found it surprising to see the results of t-tests here. Those do not appear in the methods section. I am also wondering if t-tests make sense for this kind of analysis as it isn't based on a sample, is it?

We have made substantial improvements to the figures following the reviewer's suggestions. As noted above, the font sizes have been increased throughout all figures in the manuscript. Additionally, we have included an extra legend to explain the dots and letters without the need to refer to the caption; added x-axis labels to indicate the years on the plot; and shaded the plot along the x-axis to make the years clearer. We feel that these changes improve the legibility of these plots. We acknowledge the complexity of the data visualisation but we feel that these plots are a good way to illustrate both the differences between the different scenarios and how each variable within each scenario changes between the middle and end of the 21st century.

The Student t-test is widely used in climate science to assess the differences between time-slices of future Earth System Model data, with the time-slices representing samples of the complete timeseries (with additional sampling coming from applying the t-test to monthly averages of the data.). Some published examples of this approach include Ai et al. (2021) Almazroui et al. (2020), Bracegirdle et al. (2020), and Akinasola et al. (2020). For a sanity check we repeated the analysis using the non-parametric Mann-Whitney U test, and found the same results in terms of significance.

l. 271-274 methods?

We consider it to be useful to the reader to include this information here so that it can be referred to in the context of the results.

l.292 – 308 It is quite unusual to provide this information in the results section

We agree with this, as the information in these lines is more of an introduction to concepts than a direct result. We have moved it to the introduction section as well as adding some additional references and text changes following suggestions from the other reviewer:

Page 3, lines 95-112:

Locally, this can have both positive and negative impacts on extreme 95 weather events (Abiodun et al., 2013). Cloud cover is a key component of forest-climate interactions. Observational studies have found links between forest cover and convective clouds over tropical rainforests (Bekenshtein et al., 2023), where evapotranspiration is a key driver of rainfall (Crowhurst et al., 2021), as well as over temperate forests where frontally-generated clouds are more common than deep convective clouds (Duveiller et al., 2021; Wang et al., 2009). Conversely, Hua et al. (2023) showed that tropical deforestation can reduce local cloud cover, and Xu et al. (2022) suggested that the background sensible heat flux determines the sign of the response to forest cover change. In tropical regions, the effects of large-scale forestation or deforestation in low latitudes are typically dominated by the impacts on cloud processes through increasing low-level humidity and latent heating along with CCN increases (Bekenshtein et al., 2023). ~~The~~ In the tropical troposphere, ~~is frequently in a state of instability, where lifting of air masses occurs due to strong latent heating~~ deep convection is driven by strong latent heating as a result of high humidity near the surface. Much of this convection is driven by evapotranspiration from tropical rainforests, though the extent to which this is true varies depending on the domain in question (Smith et al., 2023a).

Figs. 5 and 6 also here the fond sizes are quite small. Why are the colors reversed in 6B?

As noted above, we have increased the font sizes in all figures in the manuscript. For fig. 6B, the colour bar is reversed because the data being plotted is a humidity metric and it is more intuitive to show an increase in water to be blue, rather than red; by contrast fig. 6A is principally showing an increase in tropospheric aerosol formation.

l. 324 – 327 discussion?

As suggested, this has been moved to the discussion section.

P20, line 596:

In our model, increases in clouds, cloud water and CCN are only especially significant in tropical rainforests where these quantities are already very high. No significant differences in convective cloud at the conventional 95% confidence level were found over tropical South America and increases over the tropical Western Pacific occurred mostly in the mid-troposphere,with commensurate decreases over the tropical Eastern Pacific implying a change to the Pacific branch of the Walker Circulation. However, the lack of corresponding changes to convective cloud over tropical land suggests that this effect is not directly due to forest expansion in our scenario; Walker Circulation representation in global climate models is in any case highly uncertain (Chadwick et al., 2013; King and Washington, 2021).

l. 331-332 introduction/methods?

In this case we again feel that the information provided here is useful to the reader as it directly relates to the adjacent figure. These sentences also provide a direct link between the previous result on cloud cover and the following result on cloud water content.

l. 376-380 discussion?

As indicated, we have moved this to the discussion section.

P19, line 574:

A process chain is expected from increased latent heat flux, LWP, and cloud cover, to changes in rainfall and aspects of the general circulation (Portmann et al., 2022; Swann et al., 2012). A change in the hemispheric energy gradient resulting from forest expansion in the Northern Hemisphere, where most of the land is, drives movement of the Hadley circulation towards the warmer hemisphere (Swann et al., 2012; Laguë et al., 2021). While we see some changes to this effect, their magnitude is relatively small. There is a balance to be struck when designing experiments to investigate the climate impacts of LULCC between using idealised scenarios to elucidate fundamental processes (Portmann et al., 2022, De Hertog et al. 2024) and scenarios that reflect actual LULCC trends or proposals (Swann et al., 2015).

l. 383-390 discussion?

As suggested, we have moved this to the discussion section.

Page 19, line 566:

Our results showing changes to cloud cover and convection over the Congo may, therefore, also apply to the Amazon; high recycling rates in the Amazon and Congo would suggest an increase in ET should drive an increase in precipitation, whereas lower rates in the Maritime Continent would result in less direct influence over land, notwithstanding the potential underestimation of Amazon recycling rates in ESMs (Kooperman et al., 2018).

l. 419-441 discussion?

We consider these lines to be directly related to the results being explained here, and prefer to have the explanation of the linked processes incorporated into the results themselves rather than in a separate section to aid reader comprehension.

l. 447-455 discussion?

We think this is suitable for the results section because it is directly related to the data presented in the adjacent figures.

Fig. 9 increase fond size; the x-axis is missing in B.

As noted above, we have increased the font size throughout all figures in the manuscript. The x-axis was cropped out by a software error when the original document was converted to PDF format, and this has been rectified.

Discussion and Conclusions: Both sections do not go far beyond the results of the study. The authors start with some interesting implications in l.573, but already end this discussion in l. 579. The conclusions are otherwise basically just a summary of the study. I am also missing a discussion about the increase of natural disturbances as well as water and heat stress under climate change which may greatly dampen the potential of afforestation efforts to mitigate climate change.

We are unsure about the reviewer's comment regarding the discussion being 'just a summary of the study'. In the discussion, we place our results in the context of other recent work throughout, including on policy-relevant implications for nature-based solutions (lines 470-481 and 490-501); recent advances in understanding plant physiological responses to increasing CO2 concentrations (lines 502-513); moisture recycling representation in Earth System Models (lines 514-523); comparing our model results to recent observational studies of forest-climate interactions (lines 532-536); and suggesting how new modelling approaches could advance our understanding of this topic (lines 541-546).

As suggested by the reviewer above, we have expanded the discussion of the dynamic implications by the addition of material previously in the results section.

P19, line 566 onwards:

Our results showing changes to cloud cover and convection over the Congo may, therefore, also apply to the Amazon; high recycling rates in the Amazon and Congo would suggest an increase in ET should drive an increase in precipitation, whereas lower rates in the Maritime Continent would result in less direct influence over land, notwithstanding the potential underestimation of Amazon recycling rates in ESMs (Kooperman et al., 2018).

A process chain is expected from increased latent heat flux, LWP, and cloud cover, to changes in rainfall and aspects of the general circulation (Portmann et al., 2022; Swann et al., 2012). A change in the hemispheric energy gradient resulting from forest expansion in the Northern Hemisphere, where most of the land is, drives movement of the Hadley circulation towards the warmer hemisphere (Swann et al., 2012; Laguë et al., 2021). While we see some changes to this effect, their magnitude is relatively small. There is a balance to be struck when designing experiments to investigate the climate impacts of LULCC between using idealised scenarios to elucidate fundamental processes (Portmann et al., 2022) and scenarios that reflect actual LULCC trends or proposals (Swann et al., 2015).

Additionally, to clarify the impact of natural disturbances in addition to water and heat stress under climate change mentioned by the reviewer above we have included the following text:

Page 18, line 503:

We also do not consider the role of fire nor other vegetation disturbances, such as herbivory, pests, and disease. These may dampen the potential of forestation efforts to mitigate climate change and have important implications for future climate and air quality in a warmer world with more trees, especially given that trees under conditions of water and heat stress are more vulnerable to disease, and climate change is anticipated to increase the range of various tree disease vectors. Evaluating the fire implications of forest expansion under future climates in particular should be a research priority and will be the focus of future work.

l. 478 – 481 what about other disturbances?

As suggested by the reviewer and added above, we have now included natural disturbances in our discussion.

<u>Reviewer 2</u>

This is an important and timely study and is well suited for publication in Biogeosciences. The authors examine the impacts of global-scale forestation scenarios in the CESM climate model. The novelty in the paper comes both from the assessment of forestation scenarios and from the focus on hydrological impacts. An important policy-relevant finding is that afforestation of tropical grasslands and savannah can decrease water availability. This adds further evidence highlighting the negative impacts of afforestation of tropical grassland and savannah ecosystems.

The paper is well written. The model experiments ad results are clearly described. I suggest publication after the authors have considered these minor comments.

We thank the reviewer for their positive comments and agree that the quantification of the water demand effects of afforesting low-latitude grasslands is one of the key contributions we aim to make in this work.

Minor comments

Line 185: Do you report the difference in global forest area under the different scenarios displayed in Figure 1? If not, I think this would be useful. How does this area compare with the previous studies reported in line 70-85?

We agree that this is useful information which is missing from the text. The increase in global forest area under the Max Forest scenario is within the range of previous estimates of global potential given by Griscom et al. (2017), whereas the more moderate increase in SSP1 is below the lower bound of this range. To clarify, we have added the following in page 5, line 190:

This represents a well-established reference point for a Paris-compatible future and serves as a moderate reforestation scenario in which tree cover increases globally by 10% by 2100 compared to 2015, an increase of ~300 Mha, but there is also some deforestation and expansion of agricultural land at a regional level.

And the following in page 5, line 197:

Global forest cover expands by 26% by 2100 compared to 2015, an increase of ~750 Mha, well within the range of previous estimates (Griscom et al. 2017). This scenario achieves an average rate of CDR under SSP1-2.6 GHG forcing of 5.1 GtCO2 yr-1 by 2050 (Roe et al., 2021) and a CDR density of 146 tC ha^{-1} by 2095 (Weber et al. 2024) which are also within the ranges found in previous studies (Lawrence et al., 2018; Nabuurs et al., 2023). The total cumulative biosphere C sequestration in Max Forest by 2095 under SSP1-2.6 CO_2 is roughly 410 GtC, which is in line with the estimated additional forest CDR potential of 221–472 GtC (Mo et al. 2023).

Line 220: Bala et al. (2007) report simulated impacts of altered ET due to land-cover change. It might be useful to mention this study.

Thank you for the suggestion. We have included this reference in page 4, line 134 as Bala et al. (2007) focus on simulating deforestation impacts.

There has also been much ~~recent~~ attention given to the climate impacts of deforestation (e.g. Alkama & Cescatti, 2016; Bala et al. 2007; Bekenshtein et al., 2023; Boysen et al., 2020; Lawrence et al., 2022; Lee et al., 2023; Smith et al., 2023; Swann et al., 2015a)

And in page 18, line 501:

This is particularly relevant for forest expansion schemes in the tropics, where most of the increased tree cover in both the Max Forest scenario and the global restoration commitments is undertaken, and where biophysical benefits suggest forests can be most beneficial for climate change mitigation (Bala et al. 2007).

Line 295: Hua et al. (2023) examine impacts of deforestation on cloud cover in the CMIP6 models. It might be interesting to compare the response simulated by CESM. Xu et al. (2022) used satellite observations to examine the impacts of forests on clouds.

We have added references to both papers. As suggested by Reviewer 1 this text is now in the introduction section, as follows.

Page 3, lines 96-103:

~~Cloud cover is a key component of forest-climate interactions.~~ Observational studies have found links between forest cover and convective clouds over tropical rainforests (Bekenshtein et al., 2023), where evapotranspiration is a key driver of rainfall (Crowhurst et al., 2021), as well as over temperate forests where frontally-generated clouds are more common than deep convective clouds (Duveiller et al., 2021; Wang et al., 2009). Hua et al. (2023) showed that tropical deforestation can reduce local cloud cover, and Xu et al. (2022) suggested that the background sensible heat flux determines the sign of the response to forest cover change.

Line 303: What "effects" are you referring to here? Can you please clarify.

We have added some clarifying text drawing on the citation in this line, as well as moving it to the introduction as suggested by Reviewer 1.

Page 3, line 103:

In tropical regions, the effects of large-scale forestation or deforestation in low latitudes are typically dominated by the impacts on cloud processes through increasing low-level humidity and latent heating along with CCN increases (Bekenshtein et al., 2023).

Line 304: Is this correct "where lifting of air masses occurs due to strong latent heating"? Can you provide a reference to support this statement?

Some clarification of this point is useful while maintaining brevity, and we thank the reviewer for highlighting it. Here we are referring to the well-established phenomenon of conditional instability in the tropical troposphere, where high humidity facilitates latent heat release and convective cloud formation. While textbooks commonly explain this process without specific references (e.g., see chapter 4 in Robinson and Henderson-Sellers, 1999), we acknowledge the importance of providing support. Therefore, we have changed the sentence to make it more precise, and have also moved it to the introduction:

Page 3, line 105:

~~The~~ In the tropical troposphere, ~~is frequently in a state of instability, where lifting of air masses occurs due to strong latent heating~~ deep convection is driven by strong latent heating as a result of high humidity near the surface.

Line 375: It would be useful to discuss these results in context of Luo et al. (2022) who report the impacts of large-scale deforestation on precipitation in CMIP6 models. Also recent study of De Hertog et al. (2024).

We have expanded this and other suggested references in the discussion section as follows

Page 19, line 574:

...using idealised scenarios to elucidate fundamental processes (Portmann et al., 2022, De Hertog et al. 2024)

Page 19, line 567:

Global-scale modelling suggests that deforestation can decrease cloud cover (Hua et al. 2023) but observational studies disagree on the impacts (Xu et al. 2022, Duveiller et al. 2021). De Hertog et al. (2024) found that ESMs generally responded to a fully afforested surface with a precipitation increase, but the extent of this was model-dependent with CESM2 showing a smaller precipitation response than MPI-ESM owing to lower rates of moisture recycling.

Line 510: A few recent studies have assessed the elevated CO2 concentrations on ET and impacts on climate (e.g., Sampaio et al., 2021). They might be useful to mention here. Suggest rewording "CO2 levels" to "CO2 concentrations".

We have added a reference to Sampaio et al. (2021) and amended 'CO_2 levels' to 'CO_2 concentrations' as suggested.

Page 19, line 544:

The stomatal conductance effect would be more pronounced at higher CO_2 concentrations and further work could explore this using other SSP GHG scenarios; indeed, a recent modelling study suggested that the negative impact on Amazon rainfall of deforestation and elevated CO_2 concentrations are broadly comparable (Sampaio et al. 2021).

Additional references:

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Almazroui, M., Saeed, F., Saeed, S., Nazrul Islam, M., Ismail, M., Klutse, N. A. B., and Siddiqui, M. H.: Projected Change in Temperature and Precipitation Over Africa from CMIP6, Earth Syst. Environ., 4, 455–475, https://doi.org/10.1007/S41748-020-00161-X/FIGURES/8, 2020.

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Robinson, P. J. and Henderson-Sellers, A.: Contemporary Climatology, https://doi.org/10.4324/9781315842660, 1999.

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