

Response to Reviewers

Title: Land carbon response to positive, zero, and negative CO₂ emissions across Earth system models

Earth System Dynamics · Ref: EGUSPHERE-2026-1673

August 19, 2026

Reviewer comments:

Thank you to the authors for taking the reviewer suggestions on board. The manuscript's focus has substantially improved by moving the detailed model descriptions to an appendix and reworking the second half of the introduction. I also acknowledge the efforts to discuss potential correlations between model capabilities and outcomes in more detail.

We thank the reviewer for their time, effort, and suggestions for improving our manuscript.

In this context, I appreciated review figures R2-R5 and was wondering if the authors considered including them in the supplementary material for future reference/findability beyond the interactive discussion documents (despite the results not showing an obvious correlation).

We appreciate this suggestion from the reviewer and have added figures R2-R5 to the Appendix, as well as citations to these figures in the discussion section.

A few remaining technical comments are listed below (I am referring to line numbers of the manuscript with tracked changes). Besides, I recommend acceptance of the manuscript.

l. 78: the updated sentence looks to be missing a "which allows"

Corrected

l. 85: Probably change to an in-line citation?

Corrected

l. 89: "?" ?

Missing reference corrected.

l. 315: I realized the authors introduce the term "dynamic biogeography" as a generalized alternative to "dynamic vegetation". However, as far as I can see, that term is not used in the discussion; "dynamic vegetation" is kept instead. I appreciate the distinctions between these terms, but I wonder whether the authors might consider using "biogeography" from now on or rephrase this part.

We agree with the reviewer that it makes sense to be consistent. We have changed the phrase in the discussion to "dynamic vegetation or biogeography" to capture all categories of varying vegetation as only some models have dynamic biogeography.

l. 341: Maybe clarify that these are model-based estimates from AR6, as well (if I get this correctly)?

We thank the reviewer for pointing out that it would be useful to add a caveat about the IPCC AR6 estimates also relying on models. We have implemented the change, and also noted that the AR6 estimates are for the present-day rather than pre-industrial values. The section now reads:

These esm-flat10 modeled estimates differ from the IPCC 6th assessment report (AR6) estimates for present-day carbon stocks which are 450 PgC in vegetation, 1700 PgC in non permafrost soils, and 1200 PgC in permafrost soils, for a total global carbon budget estimate of 3350 PgC on land (Canadell et al. 2021). The total estimated carbon in vegetation and soil excluding permafrost carbon reported by IPCC is 2150 PgC (Canadell et al. 2021). IPCC estimates were made from a combination of approaches including modeling and present-day observations. We note that the comparison between pre-industrial with present-day conditions is not direct but provides a useful benchmark.

I. 357: In the response statements, the authors mentioned land carbon models in CESM2 and NorESM being (potentially) calibrated differently, despite being the same model. Suggest adding this information here, because a different calibration implies that the representation is not fully the same: "...using the same land model, albeit with slightly different calibrations."

Edit made as suggested.