

# Response to Editor's Comments on "Reconstructions and predictions of the global carbon budget with an emission-driven Earth System Model"

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We thank the Editor for carefully reading our revised manuscript and for his helpful comments and rewording suggestions. Our responses (normal font) to the comments (*italics*) are as below.

5 *General comments: Thank you for making minor technical and English language corrections. However, it seems Figure 2C is different from its previous version. In the previous version the budget imbalance term for the model was zero, but in this version it isn't. Also, at a number of places in the manuscript the term GCB is used as if it is synonymous with GCP. I have suggested changes to this in the attached annotated PDF. In addition, I have suggested few other minor changes. Please revise Figure 2C, take the other suggested changes into consideration, and go through the entire manuscript carefully again.*

10 R: We highly appreciate the Editor's efforts, reading the manuscript so carefully, and also making further rewording suggestions for improving the manuscript. Regards to Fig. 2C, the previous version is correct that the budget imbalance is zero. While revising the y-axis title as suggested by the Editor, I forgot to change the script that was used for a different variable. Thank you very much for spotting this, which has been fixed in this revision. In addition, the suggested changes for the words "GCB" and "GCP" and other changes in the manuscript are included in the revised manuscript. Few comments/suggestions are  
15 not completely taken and explained as below.

*Comment to Line 67-68: Do you have an agreement with the GCP that they will use your results? If not, please consider rewording along the following lines. The novel approach used here has the ability to provide complimentary estimates of the terms of the GCB for use in the assessments of the Global Carbon Project.*

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R: Thank you for the rewording suggestion. The GCP considered adding our predictions of GCB and we have provided our results. However, these were not finally included in the recent assessments mainly due to concerns about the timeline for publication. It is a good suggestion to reword this sentence, we have revised it as: "The novel approach of reconstructing and predicting the GCB variations with an ESM-based prediction system has the ability to provide complementary estimates of the

25 terms of the GCB for use in the assessments by the GCP."

*Comment to Fig. 2C legend: Remove the N/A since the model line should be zero.*

R: It is rather minor, but we would keep the N/A to indicate the zero BIM and keep consistent with the format of other panels.

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*Edits to Line 185: "of the emissions calculated by the book keeping approach"*

R: This has been revised to "of the emissions calculated by the DGVMs" because the numbers in the paper by Obermeier et al.(2021) are not from the bookkeeping method but DGVMs.

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