Reply to Reviewer 2:

We thank the Reviewer for the useful comments and considerations expressed on our manuscript. We agree with the suggested changes and plan to revisit the methodology in a revised manuscript as described in the following. First, we will modify the estimation of long-term effects on ecosystem productivity in the Amazon. We won't address this research question with the use of the composite analysis anymore, specifically with the methodology adapted from Power and Delage (2018). Instead, we will adopt the carbon-cycle feedback framework by considering two additional sets of simulations from the C4MIP project, namely the 1pctCO2-bgc and 1pctCO2-rad. With the former, we aim to assess the contribution of CO_2-fertilization to the cumulative carbon sink, whereas the latter allows us to estimate the influence of climatic factors (at the net of CO_2 fertilization) on terrestrial carbon. In this way, we will disentangle the relative role of both factors for the Amazon carbon sink in a future high-radiative forcing scenario, overcoming limitations of our former analysis. Second, we will modify the estimation of vegetation productivity inter-annual variability, maintaining the original multi-linear regression approach, but neglecting latent-heat fluxes, as we acknowledge the risk of a spurious attribution if evapotranspiration correlates with GPP due to the effect of CO_2, which causes a closure of the stomata and thus a reduction of vegetation productivity and inhibition of plant transpiration. With this multilinear regression, we will still account for the relative contribution of ENSO when estimating vegetation productivity, but rather than focusing on the DJF season, we will consider the yearly means of the variables of interest. This will help us overcome the fact that only a subset of the ESMs correctly reproduces boreal winter as the main season affected by ENSO impacts in the Amazon basin, as already shown in Figure S17 of our manuscript (attached below). Additionally, we will compare the capability of our multi-linear model to reproduce carbon fluxes IAV by accounting for the alternative contribution of soil moisture and precipitation, as suggested by the Reviewer. Lastly, we will assess the sensitivity of our multi-linear regression model to the number of realizations used for reach model, ensuring that any potential bias from overrepresentation of certain models is controlled. With these modifications, we are confident to satisfactorily address the different factors driving terrestrial carbon fluxes within the Amazon basin, both on long-term and interannual time-scales, to ultimately provide a fully convincing revised study in terms of both methodology and interpretation.

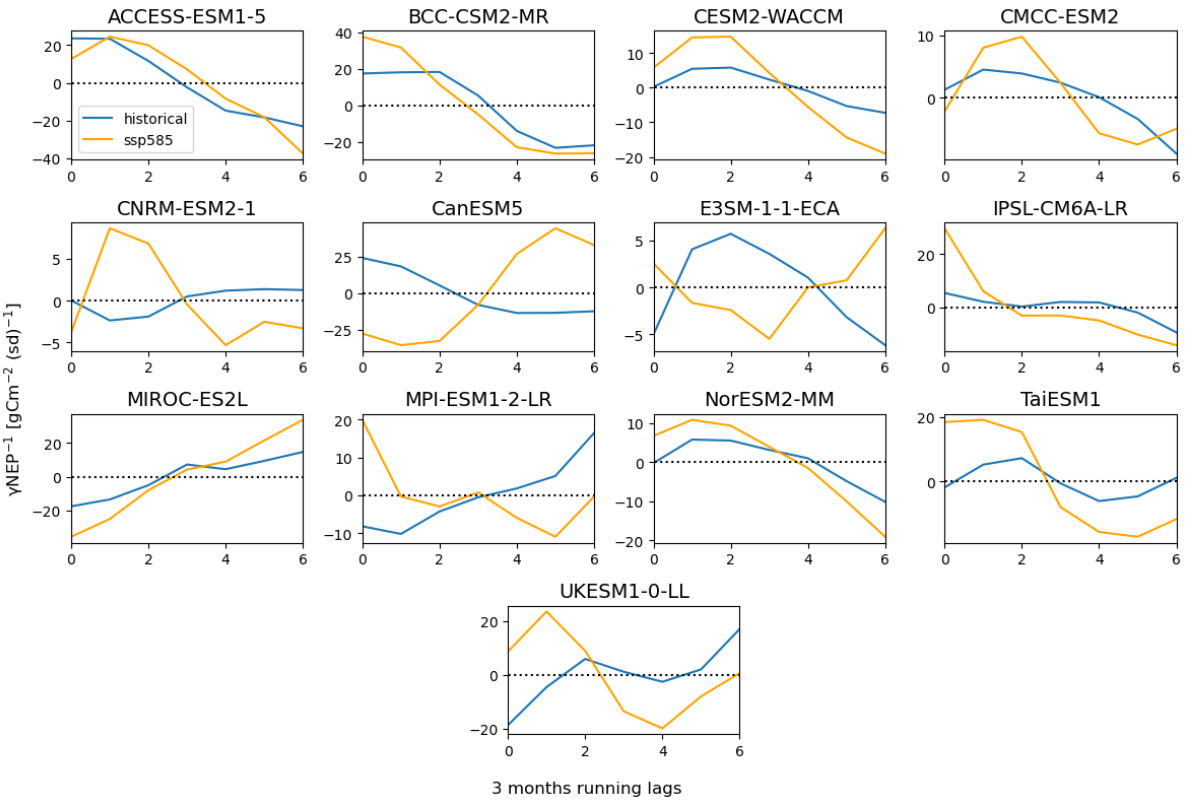

Figure S17: Time lagged ENSO teleconnection effect on Amazon basin NEP. Displayed are the value of the regression coefficient between the standardized Nino3.4 index in the DJF season, and the 3 months running zonal NEP mean in the Amazon basin. Please note that, on the y-axes, the inverse value of NEP regression coefficient is shown for clarity (higher values depict higher negative NEP anomalies).