We thank the reviewers for the constructive comments and suggestions on this study. We address the main comments one-by as explained one below.

Reviewer 1:

This is an interesting and well written paper addressing the conditions under which river terraces are formed – both a 'classic' problem as well as one with specific relevance to the Amazon basin.

At the outset I should say that I am not a modeller and not really qualified to comment on the model. Like me, others may appreciate a change to the title that clearly indicates that this is a modelling paper, not a paper with new field evidence.

Our answer:

We will change the title to: *"Climate changes and the formation of fluvial terraces in central Amazonia inferred from landscape evolution modelling"*

Specific comments

The authors model three scenarios and how they may impact terrace formation (aggradation and degradation of the channel and floodplain). Two of those scenarios explore changing climate conditions: one where conditions become wetter and one where conditions become drier. The third scenario explores base level change. The results are interesting and provide some food for thought, particularly in how these results may (or may not) be applicable to other lowland river systems.

I wonder if the authors considered exploring a broader range of conditions (in effect, a sensitivity analysis)? For example they use modern Amazonian precipitation as an initial condition and vary it by +/-30%. What are the model results if 2000 +/- 30%, 1000 +/- 30% etc are used?

Our answer:

Thank you very much for these suggestions. We actually tested many different conditions for the parameters that we used in the models in order to calibrate the model itself. In Section 5.1 we already present a general description of how the model responds to different environmental conditions. We take the opportunity, motivated by the suggestion of the reviewer, to conduct further model runs where we change the initial precipitation conditions (Fig. S11 to S19). The model indeed predicts that the erosion of the elevated plateaus adjacent to the trunk rivers becomes larger as we increase the precipitation rates (1000 mm to 3000 mm as initial condition). However, the patterns at which the low-elevated terraces form will not change. Therefore, a change of the initial precipitation rates will not alter the main conclusions. We included these additional model runs in a supplementary file.

Second, sediment discharge is dependent on water discharge using a regression based on modern observational data (line 265) but I am left wondering how valid this is under past climate regimes, especially where sediment delivery to rivers may be significantly different to today (line 480-490)?

Our answer:

We assumed that all the rivers entering from outside of the model grid are at capacity under the modern conditions. Before modelling the basin response to climate change, we generated a stable – or near steady state - initial scenario using the at-capacity condition as a-prior constraint, where the slope of these rivers are stationary for the actual (i.e., measured) values of water and sediment discharge. We then simulated variations of the water discharge for each one of these rivers using Eq. 5 to calculate the variations in sediment flux. By applying Eq. 5 we indeed assume, as noted by the reviewer, that these rivers are at capacity upstream the model grid during the model runs. Since most of these rivers have their sediment sources either in the high Andes or in the elevated plateaus with a generally thick regolith cover (an exception is the Rio Negro), we anticipate that sufficient sediment is available to be eroded by overland flow erosion so that sediment flux of the major streams is at capacity. We explain these points in the revised version of our paper (lines 483 to 488 on Track Changes File).

Finally, with regard to the larger, higher terraces compared with the smaller, lower terraces: I wonder if different mechanisms are required or if this is just a product of their differential preservation as a function of their age? If you like, an example of the Sadler effect where there is more preserved accumulation (and small scale detail) in recent sediments where older sediments have been 'edited' to leave only the broader/larger signals. Just an idea.

Our answer:

The ages of terrace deposition that are provided by Pupim et. al (2019) shows a stochastic pattern for the lower terraces. From the results of our model this pattern can be explained as a response to the climatic variations within tens of thousands of years. However, the ages and the elevation of the higher terraces could only be explained by a previously higher base level. However, we can indeed expect that at such a stage of a higher base level, climate cycles would also cause the formation of cut-and-fill terrace sequences with a similar stochastic distribution of ages. In fact, we can see such a pattern in Figure 2 by looking at the ages of the higher terraces. We acknowledge that this has not become clear in the manuscript, and we updated the text accordingly (lines 606 to 610 on Track Changes File).

Reviewer 2:

This review, which is greatly acknowledged, raised some concerns in the way the landscape is explained (hillslopes, terraces), and specific questions on the model boundary conditions.

In particular, it was not obvious to identify the terrace levels from Figure 1. Conventionally, the wetlands represent the floodplains with mid-lower terraces (< 10 m high), and the lowlands are the highest terrace systems that rise >10 m above the modern stream level. We have clarified this point in the manuscript (line 118 on Track Changes File).

A second point addresses the way of how we consider sediment generation in the model domain. In fact, since the landscape in the model domain is very flat, we can safely exclude hillslope processes as an important erosional mechanism. We rather consider that all sediment transfer and reworking is accomplished by fluvial processes. Therefore, our model only considers fluvial dynamics and related depositional/erosional mechanisms in the model domain. However, the supply of sediment from outside of the model, which also includes the high Andes, is produced through hillslope processes. We clarify these points more carefully in the revised paper (lines 203 to 207 on Track Changes File).

As a third point, the reviewer suggests removing the topography changes results for scenarios 1 and 2 in Figs. 4 and 5, due small changes along different time pictures. In fact, they are not easy to see and we added a highlight in Figure 4 showing an example of the formation of a new terrace level close to Japurá river that can be seen on the topographic map. Even with subtle changes on the topographic maps we strongly believe that the presence of these gives to the reader the real dimension of the landscape evolution due climatic variations when compared with the changes in base levels.

Kind regards,
Ariel do Prado