Reviewer 1

The authors have responded to all of my major comments and I recommend to accept this paper with minor revisions.

I would recommend to carefully read again through the whole manuscript. Some sentences are not grammatically correct and in some cases words are missing (including the abstract). Especially the new sections need to be double-checked.

A few examples include: Page 1, line 12; page 6, line 13; page 8, line 11; page 9, lines 3-6 (inconsistency in text plus wrong figure number); page 14, line 2; page 17, lines 3 and 4.

In addition, lines 24-35 on page 16 need to be rewritten – e.g. it needs to be stated that the discussion moved on to soil carbon, but also, the whole section seems to have been written in a rush.

Thank you for your useful copy edits. We have resolved the issues you've raised and re-checked the paper thoroughly.

I still do not understand why vegetation C is different for the two ELE simulations (same for the ELI simulations, table 1).

We're sorry this still isn't clear, though we're not sure why or where the misunderstanding has arisen. We speculate that the reviewer might think that these values are the anomaly between Static and Dynamic, then the anomaly between PI and LGM. Actually, they're comparing the Dynamic simulations PI – LGM, but perhaps this wasn't sufficiently clear.

We've added more description to the table caption to help ensure other readers are not similarly confused.

Review 2

I still think that the simulated vegetation cover should be compared more thoroughly with BIOME6000 data for the LGM.

We're sorry that the comparison with data we added didn't meet the reviewer's expectations. We would like to point out that we did do all the things that the reviewer suggested. We've added the following further comparison with BIOME6000:

"South-east Asia shows continued Warm-temperate, Temperate, and Tropical forest where our model simulated Broadleaf trees, which encompasses all of these biomes. The BIOME6000 reconstructions show around a dozen Tundra points on and near the bering land bridge, and our model simulates this as C3 grasses, which is the closest PFT to Tundra.

Over central Asia our model has extensive areas where the dominant land surface type is bare soil, indicating desert or sparse, dry vegetation. BIOME6000 shows a mixture of desert and dry grass/shrubland, which is generally in keeping with the low productivity, low density vegetation indicated in our model simulation.

"…Conversely, the BIOME6000 data finds that the tropical rainforest area was reduced during the LGM (Pickett et al., 2004; Prentice and Jolly, 2000; Bigelow et al., 2003; Harrison et al., 2001) and grasslands expanded, as do some modelling studies (Martin Calvo and Prentice, 2015; Prentice et al., 2011; Hoogakker et al., 2016). It is interesting to note that in the present day Amazon, BIOME6000 shows 3 points of tropical forest; 2 Savanna, 2 Warm-temperature forest; 2 temperate forest; and 3 dry grass/shrubland at the LGM. In our simulations the dominant PFT of the same area is broadleaf-trees. For comparison, Prentice et al. (2011) using LPX have tropical forest over the same domain. Therefore there is little indication that where TRIFFID may be inconsistent with BIOME6000 that another model is necessarily significantly better.

"Because of the PFT (rather than biome) approach of TRIFFID, and the limited number of PFTs, it's difficult to be sure whether trees in the tropics are a tropical rainforest at the LGM, as there are a number of biomes with significant amounts of trees. Although there is little change in PFT in the tropics at the LGM, on the margins there are reductions of vegetation carbon, suggesting a change in vegetation within the large margins of the PFTs used in this model."

Overall, the key issue here for us is what this paper contributes to current scientific knowledge. We are not suggesting that this paper provides any advancement of DGVM LGM biome/PFT modelling. Nor are we suggesting that using a DGVM at the LGM is novel or noteworthy. We are using a well-used and understood climate model and DGVM, to model a novel concept in paleoclimate (the total climate contribution of vegetation) in simulations of long and high temporal resolution time-period (120 ka).

The amounts of carbon which would be affected by the model underestimating the change from say, tropical forest to savanna, are not sufficient to change the overall message and results in the paper. Therefore, we feel that it's reasonable to focus on whether our DGVM is doing a good enough job for our purposes (to look at the global carbon changes to compare to biogeophysical changes).

In particular, the following response to one of my comments does not make any sense to me:
"The climate model used in Hoogakker et al. 2016 is HadCM3B-M1 and the climate model used here is HadCM3B-M2.1. The climate between these two is virtually identical. Since the climate is the main aspect which determines the distribution of vegetation in a DGVM, the verification of Hoogakker's work suggests that the distributions found here are also reasonable."

I don't understand how a validation done for the BIOME model driven by HadCM3B can be used as a replacement for a validation of the simulations presented in this study, which

use the TRIFFID dynamic vegetation model coupled to HadCM3B and show a very different response of vegetation in some regions.

As the reviewer suggested in their original review, we've provided a comparison between our simulations and BIOME6000 Mega-Biomes and pointed out regions where our model doesn't do well, on lines 3 – 8 on page 8. On lines 8 – 13 page 8 we compare our tropical results to other data, again, as suggested by the reviewer.

In their original review, the reviewer requested: "comparison with other modelling studies… e.g. … Hoogakker et al. 2016." We have provided that, as the reviewer has shown above. This is not as an alternative to comparing to BIOME6000, but in addition.

Having already been criticised by Reviewer 1 for "neither surprising nor new" results, we were reluctant to further reiterate a DGVM result using HadCM3B over 120 ka, as they are substantially similar to Hoogakker, as we state. We apologise if this isn't clear or helpful. It was an attempt to explain why these DGVM PFT distribution results are not particularly original.

Thus, we're between a rock and a hard place: if we provide the extensive detail one reviewer wants, we will inevitably be accused of being unoriginal by another reviewer, and also dilute the novelty and interest to a general reader. The text we've provided gives verification of the simulations overall and points out the areas of weakness in our model.

Regarding the tropics, the results presented in this paper show almost no change in vegetation cover between preindustrial and the LGM (Fig. 10). There is definitely evidence from the BIOME6000 dataset that the tropical rainforest area was reduced during LGM and was replaced by savannah/shrubland/grassland (e.g. Figure 3 in Prentice et al, 2011). This seems to be confirmed by at least some modelling studies (e.g. Hoogakker et al., 2016; Martin Calvo and Prentice, 2015; Prentice et al., 2011)). On the other hand a recent study suggests that some parts of the Amazon rainforest where resilient to reductions in precipitation during LGM (Wang et al., 2017). The results presented by the authors should be compared also to these data and critically discussed.

The reviewer is absolutely right, the results do show almost no change in vegetation cover in the tropics PI to LGM. We discuss this on page 8, line 9.

We have incorporated the references the reviewer has suggested into the discussion on page 8, as shown above. We agree that the more balanced view this provides is beneficial to the paper. We thank the reviewer for drawing our attention to these extra references.

The authors also write:
"In particular, a broadleaf tree is not necessarily 'tropical rain forest', but equally can be a temperate broadleaf forest, or even savannah type trees."
I don't think that a grid cell which is covered predominantly by broadleaf trees can be considered to be savannah.

We're sorry the reviewer seems to have misconstrued our comment as a definite assessment of a region, as we were trying to explain the foibles of our PFT model. We doubt whether it's helpful in this instance to argue about what sort of tree or biome a particular PFT or combination of PFTs is.

Figure 3. surface albedo is mentioned in the caption, but is not plotted in this figure.

Thank you for drawing this to our attention; we've altered it to say temperature.

References

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