

Final author's response to "interactive comments on *Tropical vegetation response to Heinrich Event 1 as simulated with the UVic ESCM and CCSM3* by D. Handiani et al."

By Handiani et al.

Response to Anonymous Referee#2

We thank Referee#2 for his suggestions. In the following we answer individually to each of his comments.

*This paper examines the changes in tropical climate and vegetation cover owing to an abrupt climate change during glacial condition such as Heinrich event 1 (H1). The authors use two different climate models and compare these results with pollen records from tropical South America and Africa. The models show a southward shift of the tropical rain belt and an increased of grass cover in the tropics in the Atlantic region. In Southeast Asia the models do not agree on the vegetation changes during H1. The modelled biome distributions are mostly in agreement with pollen records in southwestern and equatorial western Africa, and northeastern Brazil. The paper is well written and easy to read, **however the difference between this study and the Handiani et al 2012 needs to be stated in a clearer way in order to understand the significance of this study. Moreover a more in depth discussion of the climate changes section with comparison with proxy data is needed to further corroborate the model results related to vegetation changes.** I think this paper is suitable for publication in CP after the authors address the above-mentioned issues and the following comments.*

Answer: We now state more clearly the significance of the present study and point out differences from our earlier study (Handiani et al., 2012). The statements are included in Sect. 1, p. 3, lines 16-30. A few changes to specify our focus on the model-data comparison are included in Sect. 3, p. 7, lines 2-14, p. 8, lines 1-18, and p. 11, lines 4-31.

1) *In the introduction the authors state that previous modeling study have used a simplified atmospheric component for simulating changes in vegetation. I wonder then why the authors chose CCSM3 with such a low resolution (T31) when higher resolutions are available and may be able to provide a better hydrological cycle.*

Answer: The main reason to choose the low CCSM3 T31 resolution is to facilitate the comparison with the UVic ESCM, which has a similar horizontal resolution but differs in the complexity of the atmospheric component. A detailed explanation for using the CCSM3 T31 is stated on p. 3, lines 16-32 and p. 4, lines 1-4.

2) *In the introduction, I would suggest the authors to develop a bit more the discussion about the changes in the hydrological cycle between LGM and HI, referring to other studies (e.g. Stager et al. 2011 for proxy of HI, Mulitza et al. (Paleoceanography) 2008 for model). The authors should keep in mind that not all the proxies - showing a drying in the paper of Stager - are proxies for local precipitation (e.g. Eastern China) though, as shown in Pausata et al., (Nature Geos.), 2011.*

Answer: We implement the suggestion on p. 2, lines 24-27 and p. 3, lines 8-10.

3) *In the result section, the authors should at least provide some explanation between the different response of the 2 model after the fresh water discharge and point out which model output is closer to proxy data.*

Answer: We include a short discussion about the different responses of the two models in Sect. 4, p. 12, lines 24-32 and p. 13, lines 1-12 (see also answers to Referee#1). The comparison between model results and proxy data, and a comment which model better represents the data, have been included in Sect. 3.1.

4) *In the result section the authors compare the simulated vegetation changes against pollen proxy. They should also briefly compare the simulated precipitation with some model/proxy studies. In this way they can provide a more robust explanation on the difference between proxy and models. For example, I would suggest the authors to compare/discuss their results with Stager et al (2011, Science), where they show that the drying was not affecting only the northern Hemisphere but also but also part of the southern Hemisphere.*

Answer: We compare the hydrological results with proxy records from literature in Sect. 3.1, p. 8, lines 1-18. Our results support the evidence for a southward shift of the rainbelt during the HE period (Schefuß et al., 2011; Thomas et al., 2012). Specifically the result in the CCSM3 the effect is strong (Figure 1d).

5) *I suggest the authors to add a brief description of potential pitfalls and problems in the pollen-based reconstruction.*

Answer: We took the suggestion into account by incorporating brief description of potential pitfalls in the pollen-based reconstruction to Sect. 4, p. 15, lines 13-23.

Minor comments

- a) *I would suggest the authors to make their figures more understandable, in particular figures 1, 2 and 4. They are extremely small and it is difficult to clearly understand what they are showing*
- b) *P 5369 L 22 add “in figure 2” after “PTF cover anomalies”.*
- c) *In the discussion I would suggest the authors to explicitly state the results that belongs to their work or to whom they belongs to (e.g., end of P 5370 beginning of P 5371; P 5371 L 8)*
- d) *P 5372 LL 5 and 8 the studies the authors mention are proxy or model studies? Please, specify.*

Answer: We took the minor comments into account, corrected the figures layout, added and rephrased the sentences where necessary.