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Biogeosciences Discussions

Interactive comment on "Simulating the vegetation response to abrupt climate changes under glacial conditions with the ORCHIDEE/IPSL models" *by* M.-N. Woillez et al.

Anonymous Referee #1

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This paper describes the impact of rapid climate changes on the vegetation in Western Europe using a dynamical global vegetation model in comparison with existing reconstructions.

While I in principle support the publication of the study, I have various suggestions how to improve mainly the presentation. Right now, the manuscript is very difficult to read and the reader is distracted because of form and because of content. So please find my suggesgtions how to improve below:

- The draft is very long and contains a lot of details. Because the main analysis and discussion is focusing on Western Europe, I strongly suggest to strickly focus

on that region. This would imply:

  - Changing the title to something like “Simulating the vegetation response in Western Europe to abrupt climate changes under glacial background conditions”. In my view the name of the applied model is not necessary in the title
  - The global response of vegetation to climate change (sec 3.2 including Figs 3 and 4) should be deleted. If absolutely necessary move this to an online supplemental appendix.
  - You should try to focus more in the discussion / conclusion section.
  - You need to define somewhere, what you consider as “Western Europe”.

- You missed out one important study doing similar things, which is *Bozbiyik et al.* (2011). Please refer to it and include it in your discussion.
- The way the results are described are very difficult to read. You either should (a) insert “PFT” each time you refer to one of the acronymss of the PTFs given in Tab 1 or (b, even better) please right out the full names of the PTFs. Hardly any reader knows right away that BoNS mean “Boreal needleleaf summergreen trees”, but this phrase should have a meaning for everybody.
- Please number subfigures with letters and refer directly to them, e.g. “Fig 2a,b”, and not “top row in Fig 2”.
- Does your model also calculate a terrestrial carbon cycle? If yes, the global terrestrial carbon cycle anomalies in the experiments would be of interest, but maybe this is a future project (and with my suggestion to focus on Western Europe is maybe not that important here anymore).
- Introduction: Bipolar seesaw pattern is in Antarctica not only opposite, but also more gradual, and not that abrupt than in Greenland. Similar abrupt, but opposite

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signs are seen in sediment cores in the South Atlantic (*Barker et al.*, 2009) and should be discussed as such.

- Intro: It is said: "In the British Isles, North-West France, the lowlands of the Netherlands, Northern Germany, Denmark and North-West Scandinavia interstadials are characterized by open, treeless vegetation, whereas stadials are often marked by the presence of non-organic deposits indicating a very sparse or absent vegetation". I would argue, that open, treeless vegetation is already a very sparse vegetation, so this does not seemed to be a contradiction???
- Please introduce LGM when used the first time, use defined it at the second time.
- Still intro: "The results show a strong impact of the glacial low level of CO2 in the forest response to glacial conditions." This is weak wording, maybe "The results show that low CO2 has a strong impact on tree cover...".
- Introduce the acronym PFT when first decribing "plant functional types".
- Methods: "The spatial resolution is the same as for the climatic forcings". Please reword, e.g. "The spatial resolution in the vegetation model is identical to the spatial resolution in the climate model".
- Sec 2.2: "The ocean resolution is 182 $\times$ 149.31 depth levels." What are 149.31 depth levels? This should be an integer number, something weird here.
- Sec 2.2: For the glacial climate simulation vegetation is fixed to present day distribution, including agriculture. This needs some error estimates or further justification: Do you have vegetation where ice sheets are? How large is the difference in potential natural vegetation from present to LGM and what would be the impact in the climate, and here, especially how large is the part of the agriculture???

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- Results, page 12907, line 14: “This result is in qualitative agreement with pollen data for South America.”. Please support with a reference.
- Sec 4.1.2: “These values are above but close to the reconstructions by Wu et al. (2007), except for the western band at 43° N, corresponding to the Iberian Peninsula, where precipitations are overestimated by more than 500 mm yr-1.” I found these results are within the uncertainty range given in the figs, thus they agree, and there is no overestimate.
- page 12915: You asked the reader to compare Fig 11 with Fig 7 to see when climate changed with respect to vegetation. You should already indicate in the time series plots (Fig. 11, 13, 14, 15) when temperature changed abrupt in your simulations, e.g. maybe by some vertical markers.
- Maybe you show something such as “tree cover” in a figure, not only individual PFTs.
- Sec 5.2.2 Please rephrase header to “Relative impact of changes in temperature and precipitation during a gradual collapse of the AMOC on forest cover”.
- Please make a spell check to find typos such as “Nordeste” on page 12921.
- page 12923: “the time-lag between is related to vegetation dynamics.” Something missing after “between”.
- page 12924: “In the south of Iberia (Alboran sea site ODP 976) steppic vegetation reaches its maximum in 700–1000 yr for H5, 500–800 yr for H4 and 400–700 yr for H1 (and the following lines’).” It is not clear to what these times refer to, after a rapid temperature change or some first occurence of IRD???

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References

Barker, S., P. Diz, M. J. Vantravers, J. Pike, G. Knorr, I. R. Hall, and W. S. Broecker (2009), Interhemispheric Atlantic seesaw response during the last deglaciation, *Nature*, *457*, 1007–1102, doi:10.1038/nature07770.

Bozbiyik, A., M. Steinacher, F. Joos, T. F. Stocker, and L. Menviel (2011), Fingerprints of changes in the terrestrial carbon cycle in response to large reorganizations in ocean circulation, *Climate of the Past*, *7*(1), 319–338, doi:10.5194/cp-7-319-2011.

Interactive comment on Biogeosciences Discuss., 9, 12895, 2012.