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Climate of the Past Discussions

Interactive comment on "Transient simulations of the carbon and nitrogen dynamics in northern peatlands: from the Last Glacial Maximum to the 21st century" *by* R. Spahni et al.

Anonymous Referee #2

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General comments

Although peatlands cover only a small part of the global land surface, they have the highest carbon density and their development during the Holocene has influenced the global carbon balance. A proper representation of peatlands in global carbon models is therefore important. The paper contributes an improved peatland module in a dynamic global vegetation model. I agree that including nitrogen cycling and dynamic acro- to catotelm transfers are good changes. There is not much model description and I have sometimes difficulties understanding the simulation results as presented in the figures (see further below). Not clear to me is the role of the plant functional types. How do

they compete for nitrogen? Do they influence the carbon balance? Simulated peatland carbon density compares quite well to soil carbon density date in North-America, but it is not clear to me whether the prescribed peatland area influences this soil carbon density. The manuscript could be written more concisely, although in some other places more explanation is needed. I find the sections 5.2 and 5.4.2 less interesting.

Specific comments

p.5636, l.26 LPX is new for me. What is the relation with LPJ models? It is a new name for the LPJ models?

p.5639 Does varying water table also influence GPP or NPP or competition between the PFTs?

p.5640, l.25 What is N availability in the model? Is it the sum of N inputs and N mineralisation from soil organic matter? Do the PFTs compete for the same N sources?

P5642, l.1 It surprises me that Sphagnum has a lower C:N ratio (i.e. higher N concentration) for new production than the graminoids. Does this mean that growth of Sphagnum is more often N-limited than growth of graminoids? Generally it is assumed that Sphagnum growth is less nutrient-limited than vascular plant growth. N concentrations in Sphagnum are generally related to N inputs and can be quite high, as in the Netherlands with high atmospheric N deposition. Such N concentrations do not reflect N demand.

p.5655, l.9 ... shoals ...?

p.5658, l.7 So what is the conclusion of this comparison of alternative peatland development scenarios?

p.5661, l.23-24 How come that the temperature effect is so small? Is there also a difference in precipitation between the two RCPs that partly compensates for the temperature difference?

p.5662, l.3 Remove ... and the Holocene

Table 1 Is there a difference between moss and graminoid decomposition rate? Sphagnum is generally overrepresented in the peat due to their low decomposability.

Table 3 Please explain T09, T09LGM and Y10 scenarios in the legend. Is it correct that T09LGM ends with exactly the same peatland area as in T09?

Fig. 3 Why are thermokarst lakes in this figure?

Fig. 5 Why are simulated (and reconstructed) accumulation rates higher in Siberia than in North-America and Europe? Interesting that DyN increases accumulation rate in Scotland and decreases accumulation rate in Finland. Does this imply that NPP was not N-limited in Scotland and highly N-limited in Finland?

Fig. 6 These results I do not understand. How can GPP in many points be larger with DyN than without DyN? Why is NPP with DyN so much lower? Does autotrophic respiration depend on N availability?

Fig. 7 This figure seems not necessary to me.

Fig. 9 I cannot read the axes labels, font is too small

Fig. A1 I accept that there can be large deviations for several reasons, but is there perhaps a pattern from which we can learn about model behaviour?

Interactive comment on Clim. Past Discuss., 8, 5633, 2012.