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Biogeosciences Discussions

Interactive comment on "Modelling past, present and future peatland carbon accumulation across the pan-Arctic" *by* Nitin Chaudhary et al.

Anonymous Referee #2

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Review of "Modelling past, present and future peatland carbon accumulation across the pan-Arctic" by Nitin Chaudhary, Paul A. Miller and Benjamin Smith.

In their manuscript "Modelling past, present and future peatland carbon accumulation across the pan-Arctic" Chaudhary present and discuss results of their model for peat accumulation and decay for the past and the near future. The authors present peat accumulation rates at randomly selected locations and discuss how these change under changing climatic conditions.

Overall the manuscript presents novel results and is of interest to a substantial number of readers of biogeosciences. However the current version of the manuscript is very difficult to follow and lacks clarity. It therefore requires major revisions before publication.

Over large parts of the manuscript the reader is wondering what the authors want to tell him or her. This is especially severe in sections 3 and 4, where results are reported and discussed. The section 3.2, first paragraph is one example: Here the authors discuss results of climate change experiments. Reading the paragraph feels like a near endless list of carbon accumulation rates defined in slightly different ways and for different regions. It is not possible to list all occurrences of lacking clarity, therefore I suggest the authors carefully look at the manuscript and rewrite unclear sections.

In addition the conclusions section is extremely weak and vague in discussing the conclusions, while half of the section consists of an outlook that is out of place in the conclusions section.

Finally, the authors only scratch at the surface of the capabilities of their model. LPJ-GUESS should be able to determine changes in vegetation composition – however these are not discussed in the manuscript. Similarly, the authors lay claim to unique capabilities of their model (Conclusions section) – however the results of these unique capabilities are not actually discussed.

In addition there are a number of minor issues:

- The climate forcing used to drive the Holocene experiment is unclear, the reader needs to read Chaudhary et al. (2016) in order to understand how it was derived. A two sentence summary how it was derived, including the Miller et al reference, would help.

- Fig. A1 is a reproduction from MacDonald et al. 2006. It is therefore not needed, the authors can refer to the original figure.

- Page 8 / line 289: The authors refer to regions with shallow active layers (ALD < 0.1m) and refer to their Fig. 6a. This is impossible to follow, since the Fig. only show ALD 50-100 cm, 100-200, 200-300 and > 300 – the range referred to in the text is not shown.

- Page 9 / line 325: the authors refer to Fig. 5b. I assume they mean 6b?

- Page 9, lines 324-329: The paragraph deals with temperature effects. The authors then refer to their Fig. 8 III and IV – however panels III and IV show the precipitation and CO2 effects. Clearly there is some logical error in this paragraph.

- Page 11, line 375: The authors write that Loisel et al. is limited to north of 69°N. However it is south of 69°N that is meant.

- Page 11, lines 381 ff: unclear, when moist conditions played a role

- Page 12, lines 415-418: Is this trend only reported in the literature, or does it also occur in the model?

- Page 14, line 490: the authors refer to Fig. 8 b, c and d, but they mean II, III, and IV

- Fig. 4: What the authors call a “dotted” line in the Figure legend is usually referred to as a “dashed” line. In addition, the black line discussed in the legend is invisible in the Figure.

- Fig. 6: Choice of colours is less than perfect. 1) Are no active layer depths of less than 50cm shown? This is implied by Figures 6a and b. 2) the colour scale chosen in Fig. 6c usually implies a symmetric range from positive (green) to negative (red), with no change indicated by yellow. However in this Figure all values are negative.

- Fig. 7c: Colour scale not symmetric – zero value unclear (see also my comment to Fig. 6, part 2)

- Fig. 8: The same dashed / dotted issue as in Fig. 4

- Fig. A2: Colour scales are not centered around zero and are different between plots, making comparisons very hard.

- Fig. A3: On an A4 printout, this Figure is still too small to see any details. In addition, there are no axis subdivisions between -0.5/0/0.5, making it extremely hard to read

anything from the Figure.

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