

Reviewer 2 Reviewer's comment	Author's comment - page and line numbers refer to the reviewed version
	Thank you for the review. It appears that page number references are off by 1 page.
<p>... I think the paper would be improved if the authors provided more clarity and emphasis on how wetlands and permafrost zones were handled in the analyses. In particular I found it difficult to discern how wetlands (including peatlands) were parameterized and how peatlands in permafrost zones were handled.</p>	We agree that in this particular field the explanations could be improved. Further explanations are provided below.
<p>I was unable to open the files in Supplements 1 and 2.</p>	We will clarify the instructions for files 1 and 2 contained in the Supplement. "To be used with Netica (Norsys, Vancouver, Canada). Readable with any text browser (change the file name tag to '.txt')."
<p>There is no mention, in the introduction or discussion, of the potential impact of natural disturbances (e.g., wildfire, insect outbreaks, windthrow, etc.) on soil C dynamics. [...]</p>	We will add examples after line 3 p366 as suggested by reviewer 1.
<p>Page 367 lines 11-17; Is there a mechanism in your model or algorithms that allows for carbon [in] the inaccessible pool to transfer to one of the accessible pools as a result of climate change, land-use, or land-use change? Please explain.</p>	Within one instance in time, the inaccessible pool does not participate in the decomposition of organic matter. However, the fraction of the total C pool that is inaccessible can differ between reference and target conditions due to e.g. differences in water-logging or melting of permafrost. We added a clarifying sentence after line 17, p 368.
<p>Page 369 lines 16-18; indicates all inputs (equal to NPP) go into the fast and slow pool; then on page 367 lines 5-7 all inputs go only into the fast pool. Please clarify. If inputs go to both the fast and slow pools please explain the rationale for how the inputs are split between the fast and slow pools.</p>	We intended to say in lines 16-18 that all NPP initially goes into the fast pool, which is part of the accessible pool. We shortened the sentence ("is added to the fast pool") for clarity.
<p>Page 369 lines 24-25; It would help if you could explain the difference between your definition of zonal and azonal. Here you appear to describe wetlands as only being "azonal". There are areas in the world where wetlands (e.g., peatlands) are zonal, as I would define them (widespread, dominant soil type). Please clarify.</p>	We agree that wetlands can be part of the zonal vegetation. While trying to keep the text to the point, we now refer to wetlands as a special vegetation type and land cover and clarify that we mean climatic vegetation zones.
<p>Page 371 lines 1 and 2; Please expand your explanation of how oxygen availability is determined, what data is used from the</p>	Oxygen availability is a characteristic derived from the HWSD by Fischer et al. and we used their product. A

<p>HWSD and how?</p>	<p>short explanation is currently available here: http://www.fao.org/soils-portal/soil-survey/soil-maps-and-databases/harmonized-world-soil-database-v12/en/ We added from this summary a little more information in the text but otherwise refer the reader to the original publication.</p>
<p>Page 371 lines 22-24; I looked at Grace et al. 2006 which appears to apply only to mineral soils. Did you use the same expression based on CEC for organic soils that can have CEC values that are much higher than occur in mineral soils? Please clarify if this expression was only applied to mineral soil which would be appropriate.</p>	<p>In calculating the CEC of the soil we considered only soils with <20% OC content. This will be specified in the revised text.</p>
<p>Page 375 lines 6-9; Please explain how C is protected by high CEC. How would this apply to organic soils?</p>	<p>This explanation refers only to mineral soils and 'protected' should be better phrased as "stabilized". This will be specified in the revised text.</p>
<p>Page 377 line 27; Would you explain which tundra regions in the world are expected to be able to support boreal forest plantations? Where would soil profiles be thick enough to support plantations?</p>	<p>The conversion of boreal forests is hypothetical. We considered only climatic conditions (i.e. vegetations zones). This will be mentioned in the updated version in the Methods section (end of section 2.4).</p>
<p>Page 378 lines 2 and 3; This is an example where it was difficult for me to interpret or understand the statement because wetlands were not treated explicitly enough in the paper. This statement may be true for mineral soil permafrost areas that might convert to wetlands, but we also have permafrost peatlands that are already wetlands. What is expected to happen when they thaw?</p>	<p>The conditions 'wetland' and 'depth of active layer' imply a restriction of the fraction of the soil accessible to decomposition and we use the minimum depth of both. That is, decomposition in a wetland with a deeper active layer after thawing would still be constrained by a high water table associated with wetlands. This will be explained in the Methods section.</p>
<p>Page 378 line 4; Again a more explicit treatment of peatlands would help with interpreting this statement. Do you mean that regions that are boreal now, and remain boreal in the future will have more timber plantations and arable land? Or areas that are now Arctic or tundra, become boreal and they will have more timber plantations and arable land? For example, as one moves north in the boreal of Canada peatlands become more dominant on the landscape. It is unlikely that even if climate changes that</p>	<p>We generally consider only the climatic but not the edaphic suitability for a change in vegetation. The exact transition probabilities are listed in Table S4.3 in the Supplement. For wetlands, we assume that they remain wetlands in cold climates and have a low probability ($\leq 3\%$) of drying out in warmer climates. This information will be added to the main text. The</p>

<p>these peatlands are an appropriate soil type for plantations or arable land. Please clarify your thinking.</p>	<p>explicit land-use conversions in point comparisons are also hypothetical and illustrate the potential effects without regard for the appropriateness of soil conditions for such a change.</p>
<p>Page 379 lines 17-20; But doesn't Todd-Brown et al. 2014 question the validity of these models in the first paragraph of their conclusions?</p>	<p>Yes, he does. We wanted to point out that our approach (in the unlimited NPP scenario) produces comparable results as mechanistic models do. Our results under the limited-NPP scenario support Todd-Brown's concerns.</p>
<p>Page 372 lines 2-3; This statement is just a little bit unclear. Does your statement mean "Above- and belowground fine (leaf and fine roots respectively) and above- and below ground coarse (coarse woody debris and coarse roots respectively) contribute. . . ." Please clarify.</p>	<p>Yes, this is a better way of putting our statement on p. 373.</p>
<p>Page 374 line 21; Is NNP a typo? Should it be NPP? If this is the case NNP also appears in Supplement 3, page 5 and should be corrected.</p>	<p>Yes, a typo. Thank you.</p>