Geosci. Model Dev. Discuss.,
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Geoscientific Model Development Discussions

Interactive comment on "ORCHIDEE MICT-LEAK (r5459), a global model for the production, transport and transformation of dissolved organic carbon from Arctic permafrost regions, Part 1: Rationale, model description and simulation protocol" *by* Simon P. K. Bowring et al.

Anonymous Referee #1

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The authors adapt and apply the fusion of several existing models to predict soil and riverine DOC fluxes. Part I of the study lays out the justification for this approach, as well as giving some information on the approaches and parameterization used in the model to ultimately apply the model in the Lena River Delta. While I think that this work is important and timely and I think the general approach is valid, there are several points (and inaccuracies) that need to be addressed and clarified before this manuscript can be accepted for publication. Overall, there are many parts that are quite

confusing that could be resolved by some revisions to the terminology and further edits and streamlining of the text.

Specific comments:

Line 46: the "migration of permafrost line" really only makes sense on a map. Perhaps rephrase.

line 50: the authors pulled out some very high number, I don't know where this came from. McGuire 2009 estimates a lateral flux of 80 Tg C and a net "arctic" land sink of 600-800 Tg C. That makes the DOC component ∼10% of NEP.

155-156: I think these numbers need to be double checked. The point of this paragraph could be clearer.

AO: This is my preference, but it wouldn't add much space to write out Arctic Ocean and it would be more intuitive to follow.

249-254: This paragraph is confusing. The points could be expanded and clarified
265-274: This is quite confusing and makes what is new here unclear.

289: This is the first mention of this site specifically, and it really comes out of nowhere. Consider introducting the site before this.

430: Typo 437: typo

444-446: Confusing. This sounds like a lake or pond

474: typo

4780480: confusing

498-490: Justification for this approach would be helpful (add supporting references)

508-525: These water pool names are really confusing.

527-534: I'm having a difficult time following this

528-540: seems like there would be less organic matter to leach from on higher slopes.

Equation 2: needs units, what does 12.011 represent? A carbon unit conversion? Equation 3, 4, 6, ditto. If these are empirically derived parameters there needs to be a reference.

Figure 1. part k. K: assumption of soil C distribution, differences between continuous and discontinuous. Don't know how well supported this is – perhaps some justification could be found in the literature.

Terminology between headwaters, tributary in figure vs. manuscript text are confusing.

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