

Geosci. Model Dev. Discuss., referee comment RC1 https://doi.org/10.5194/gmd-2020-377-RC1, 2021 © Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.

Comment on gmd-2020-377

Anonymous Referee #1

Referee comment on "A permafrost implementation in the simple carbon-climate model Hector v.2.3pf" by Dawn L. Woodard et al., Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-377-RC1, 2021

General comments:

This study projects permafrost thaw and associated GHG emissions using a new representation of permafrost, which was integrated to the global carbon-climate model Hector. The authors use air temperature projections to quantify permafrost thaw. They acknowledge the limitations that come with the use of a simple model such as theirs, and do not over-interpret their model outputs.

I enjoyed reading this manuscript and believe it will be of broad interest to the scientific community as well as informative to IAMs. The Discussion section does a great job at documenting the model limitations (as a field ecologist, I appreciate that); I also think the section that compared this study's model outputs with that of other models was beneficial to the reader.

I'd be interested to see a few more details pertaining to: (1) How is the "static" (nonlabile) C fraction in the permafrost determined? (2) Why is the CH4 emission fraction from thawed permafrost set to 2.3% (please add references or some kind of explanation), and how much effect would a lower or higher fraction have on GHG (provide graphs)? (3) How sensitive is the model to the permafrost pool size (provide graphs of projected GHG under different pool sizes)?

Minor comments:

If possible, add Hugelius et al 2020 (PNAS; https://www.pnas.org/content/117/34/20438) to Table 4, and discuss their findings in light of yours.

I-39: "models" is there twice

I-181: fix the typo in the word "parameter"