The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
https://doi.org/10.5194/tc-2022-12-RC2, 2022

Comment on tc-2022-12

Anonymous Referee #2

Referee comment on "Molecular biomarkers in Batagay megaslump permafrost deposits reveal clear differences in organic matter preservation between glacial and interglacial periods" by Loeka L. Jongejans et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-12-RC2, 2022

Permafrost soils store more than 30% of the global surface organic carbon. The thaw-induced carbon release in the form of greenhouse gases would create a positive feedback to amplify climate warming. In this paper, Jongejans et al., present the valuable records of TOC, TN and multiple lipid biomarkers to assess organic matter quality in a 650-ka ancient permafrost of east Siberia. Such old records cover glacial-interglacial climate variations, which provides a valuable opportunity to explore potential influence of climate changes on permafrost carbon cycling. Their biomarker evidences show higher organic matter decomposition during interglacial periods. This will be very useful for understanding of carbon cycles in permafrost regions as global climate warms. I have no major comments on this valuable paper and hence recommend to accept it after the following minor/moderate comments have been covered.

L22: Add what lipid biomarkers did you analyze in this study, such as alkanes, fatty acids.

L29: Delete “or bacterial”. Microbial origin contains bacterial origin.

L36: the world’s surface soil carbon?

L57-58: Biomarker tools as tracing permafrost thaw and carbon cycling are very important in this study. I suggest more previous publications are needed to introduce here. Multiple lipid biomarkers have been applied to sediment records for reconstructing carbon perturbations of permafrost (e.g., Evert et al. 2016, https://doi.org/10.1177/0959683616645942; Yao et al., 2021, https://doi.org/10.1130/G48891.1).

L115: What solvents (including solvent volume) do you use for separation the aliphatic, aromatic and polar NSO?

L127: The first mention of abbreviation "FA" is fatty acids?

L127: ACL can be also affected by climate changes and resulting alkane degradation, such as temperature and relative humidity. Terrestrial plants tend to produce longer n-alkanes to protect their water loss under higher temperature and drier conditions. Moreover, higher temperature and wetter conditions may facilitate higher microbial activities, may resulting in the faster degradation of organic matter.

L148: Add "may" before "contain".

L145-146: Could you show a supplementary figure or table for these correlations?

L227: Please specify what biomolecules or organic indices can give insight into different OM sources.

L240: Change to "higher ACL" and "lower P_{aq}".

L260: Add a supplementary figure or table for these correlations. And elsewhere.

L280: Higher ACL does not indicate higher terrestrial source. Higher temperature or drier climate can also lead to higher ACL values.

L285: ACL can be affected multiple factors. Please see my comment "L127".

L308: Are there aquatic plants grow around the study area? Higher P_{aq} ratios could also be due to input of mosses - they also produce lots of mid-chain n-alkanes.

L318 and 330: Again, delete “or bacterial”. Microbial origin contains bacterial origin.

L346: Change to “rivers”.

L357: Add more references (e.g., Evert et al. 2016, https://doi.org/10.1177/0959683616645942; Yao et al., 2021, https://doi.org/10.1130/G48891.1).

L359: Please specify what past environments.

L370: The impacts of findings should be described as well. E.g. why are these findings important and for whom?

Table 2: Add m/z data of molecular weight, base peak, and characteristic peak of each individual compounds.