The Cryosphere Discussions

The Cryosphere Discuss., community comment CC1
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Comment on tc-2022-135 by Paul J. Morris

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Community comment on "Environmental spaces for palsas and peat plateaus are disappearing at a circumpolar scale" by Oona Leppiniemi et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2022-135-CC1, 2022

General remarks

I enjoyed reading this interesting manuscript by Könönen et al., which seeks to fit bioclimatic models to permafrost peatland landforms, and then project those models into the future under two of the four RCP scenarios to examine shrinking climate spaces. The findings agree with other recent studies that strong climate migiation may retain some areas that are climatically suitable for permafrost peatlands by the end of the century, while the failure of climate change mitigation will lead to an almost-complete loss of suitable climate space.

The study is strikingly similar to a paper that my group published earlier this year in Nature Climate Change (Fewster et al., 2022), to the point that much of the method and some of the conclusions are all but identical. Given the timing of the two articles, it appears that the two groups have been working on similar studies simultaneously. The timing is of course inconvenient for the group that publishes second, who find the novelty of their study reduced. Comparisons between the two studies are inevitable. I am sympethetic to this potentially awkward situation, and I believe there is certainly room in the literature for this new study. In their favour, Könönen et al. have a larger spatial domain than ours, a much finer grid resultion, and a more detailed representation of soil organic carbon as a continuous variable rather than our simple binary peat presence/absence. All of these things add value and novelty to the current study. On the other hand, Könönen et al. omitted RCP2.6, and therefore don't provide an optimistic, "best case" future scenario; and the large increase in spatial domain comprises extremely data-poor regions, leading me to question the validity of the findings there.

Substantive issues

My main concern is how far the authors have had to extrapolate from extremely sparse observataional data in central and eastern Siberia. This is particularly evident in Fig. 1a, which shows that there are about 20 observations across the whole of this huge area, despite the widespread distribution of modern permafrost, and plenty of peat there too. It is difficult to believe that tehre are so few palsas and plateaus there, and the authors acknowledge later on that more observational work is needed in these areas. However, the consequence for the current study is that the vast majority of observations are in western Siberia, Europe and North America, meaning that the statistical modelling is in effect a hemispheric extrapolation of a model fitted to specific locations. The paucity of observations in central and eastern Siberia is the main reason we omitted these regions from our own study. It is quite possible that palsas/plateaus in C/E Siberia occupy

different climatic envelopes than those elsewhere, but without observational data we can't tell. As stated above, I am sympathetic to the fact that our two groups appear to have been working on similar studies at the same time, and without central and eastern Siberia, the current study loses much of its novelty. Therefore, I recommend that the current authors make it clear early on (in their aims and/or methodological summary) that the modelling in central and eastern Siberia is an extrapolation from models fitted to N America, Europe and W Siberia; and qualify their findings throughout accordingly

The authors have used only two of the four RCP scenarios - the pessimistic, worst-case RCP8.5, and the moderately-optimistc RCP4.5. However, it would be valuable to see the other two scenarios, RCP2.6 and 6.0. too. In particular, there may be a big difference from RCP2.6 to RCP4.5. Even in RCP4.5, we can see that the large majority of of the 20th century climate space has gone. We recently showed (Fewster et al., 2022) that the lowest emissions scenario (SSP1 in our case) predicts the preservation of much of the original climate space in western Siberia. A similar finding across the larger study area here would be valuable to know. I recommend that the authors add at least RCP2.6 to their analysis, if not RCP6.0.

Other than these things, I found the paper to be mainly logical and well-written, clearly and attractively illustrated, and with sound and reproducible methods. The comparison of predictions of shrinking palsas to remotely-sensed images of thermokarst ponds is a clever way to provide some validation.

Minor and typographical issues
Throughout - overuse of the word "the". I have been through the PDF manuscript and added strikethrough annotation to examples that could be deleted for improved English. Please see attached.

27 - primarily in regions

28 - ...differ mainly in their extent and height...

39 - important to global carbon budgets, palsas and peat plateaus

46 - classified palsas as critically endangered

60 - not found in the Southern Hemisphere

79-85 - the method description here is almost identical to that by Fewster et al. (2022), which you cite elswhere. Even to the point of identifying the search terms for nations and Canadian provinces. It would seem appropriate to acknowledge that this is all but the same method.

100-101 - in the evaluation set were selected so that they were located at least

101 - crietrion (not criteria; singular, not plural)

102 - as they were located too close

117 - were computed separately

142-3 - jumbled sentence, please reword. I can't follow the intended meaning of this sentenmce, so can't suggest an edit myself.

153-4 - some justification would be in order here. Why not consider interaction terms? Particularly given that they are included in the random forest model.

192 - remove superfluous comma after "Other".

192 - were found in the Northwest Territories...

350 - also affect

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Please also note the supplement to this comment:
https://tc.copernicus.org/preprints/tc-2022-135/tc-2022-135-CC1-supplement.pdf