

Dear Editor,

We are especially grateful to your helpful comments. According to those suggestions, we have made thorough revisions to the manuscript. In particular, we modified related grammatical errors or problematic expressions. The changes made to the text are highlighted in blue so that they may be easily identified in the revised manuscript.

Yours sincerely,

Tonghua Wu on behalf of all co-authors

Response to comments:

1) The title seems lengthy and tedious, particularly the description of the location. There is also missing a comma before “and”. I would encourage the authors to simplify it a bit to be clearer.

Response:

Thanks for the suggestion. In the revised manuscript, we changed the title to “Permafrost, active layer, and meteorological data (2010–2020) at the Mahan Mountain relict permafrost site of Northeastern Qinghai-Tibet Plateau”.

2) It is common that the authors had miss used “the”, both missing and wrongly used when there were not needed. For example:

a. Line 21, missing “the” before “Mahan”. The similar issue can also be found in other parts of the manuscript.

b. Line 116, missing “the” before “relict” unless the authors believe that no relict permafrost in the world is sensitive to climate warming.

c. Line 188, missing “the” before “Mahan”.

Response:

In the revised manuscript, we added “the” before “Mahan” and “relict”, and all of similar issues are also improved.

3) Line 55, 273, missing comma before “and”; line 408, missing comma before “north” and “central”.

Response:

Changed.

4) The second last paragraph in the Introduction also dedicated to describing the site in the Mahan Mountain, so as the section 2.1. I would suggest the authors to reorganize the two paragraphs to make the narration clearer.

Response:

Thanks for the suggestion. In the revised manuscript, we improved it. In the second last paragraph of Introduction, we mainly described the location and particularity of the Mahan Mountain relict permafrost (Line 74-87). In the section 2.1, we described establishment, early field work, and main features of the Mahan Mountain relict permafrost observation site (Line 97-112).

5) Any citations to the statements in line 110 and 126?

Response:

Thanks for the suggestion. In Line 110, the description of “The original permafrost area was approximately 0.16 km², the area of which has recently been reduced to 0.13 km²” was cited from the literature of Xie et al. (2013), in the revised manuscript, we added this citation (Line 105).

In Line 126, the results of mean annual air temperature and the duration of negative air temperature are acquired from the observed meteorological data of the Mahan Mountain monitoring site, and this sentence has explained clearly (Line 120-123).

Xie, C., Gough, W. A., Tam, A., Zhao, L., and Wu, T.: Characteristics and Persistence of Relict High-Altitude Permafrost on Mahan Mountain, Loess Plateau, China, *Permafrost Periglac. Process.*, 24, 200-209, <https://doi.org/10.1002/ppp.1776>, 2013.

6) Figure 1, the first sentence is not grammatically correct.

Response:

We modified it as:

The location of Mahan Mountain relict permafrost region in China (a), the spatial distribution of permafrost and monitoring sites in the study region (b). (Line 114-115)

7) Line 121, “derived based on ...” is not a correct expression.

Response:

We modified it as:

The permafrost distribution of the Mahan Mountain is derived from Xie et al. (2013). (Line 117-118)

8) Line 122, “map” and “data” were redundant, suggest drop one of them.

Response:

We deleted “map” in the revised manuscript.

9) Line 159, change “the same ...” to “homogeneous”?

Response:

Changed.

10) Line 160, change “While” to “After”?

Response:

Changed.

11) Line 170, change “is as follows” to “is presented as following (Table 1)”.

Response:

Changed.

12) Line 210, change “but” to “and”.

Response:

Changed.

13) Line 227, change “0-100%” to “100%”?

Response:

Changed.

14) I think it would be helpful to clarify that 6999 was adopted as the fill value.

Response:

Thanks. We clarified this in the revised version as:

(1) The negative values for wind directions were replaced by 6999 (Line 232-233).

(2) In the case of missing data persisting for a longer time, we filled them with 6999. Overall, all the missing or abnormal soil temperature and soil volumetric water content data were replaced with 6999 (Line 261-263).

(3) Quality control was carried out to check whether the data were missing or invalid, which was replaced by 6999 as no data (Line 378-380).

15) Line 246, 247, ..., please remove “data” because data was not the measuring subjects.

Response:

Thanks for the suggestion. In the revised manuscript, we removed the “data”.

16) Line 250, I would suggest the authors to clarify the resampling method.

Response:

We modified the sentence to "We finally resampled the 30-minute soil temperature and soil volumetric water content data into daily data by averaging the half-hourly data within a day." (Line 245-247)

17) Table 3 and other parts of the manuscript. It should be expressed as “#1” instead of “1#”.

Response:

In the revised manuscript, we changed all similar expressions both in text

and Figures.

18) Line 370, it is incorrect to express “at ... mountain”. Please use “in/on” or clarify it to be the site.

Response:

Thanks for the suggestion. In the revised manuscript, we changed it to “at the Mahan Mountain permafrost region”.

19) Line 407/409, change “/a” to “/year” or the other way around to be consistent through the manuscript.

Response:

Changed.

20) Fig. 4, Fig. 5, and Fig. 10: Please add x-axis title to make them consistent with other figures in the manuscript.

Response:

Thanks for the suggestion. In the revised manuscript, we added x-axis title in related Figures.

21) Line 409-411, the expression “Russian European north, western and central Siberia, ...” seems confusing.

Response:

This expression was cited from the Smith et al. (2022), which was as follows:

Table 1 | Average regional rates of ALT changes from CALM network data

Region	Average ALT change (cm per year) ^a	Range of ALT change (cm per year)	Number of sites ^b
Alaska North Slope	0.2	-0.1-0.5	25
Alaska interior	0.9	0.2-2.7	5
Canada (Mackenzie Valley and eastern Arctic)	0.0	-1.0-0.7	7
Nordic (including Svalbard and Greenland) ^c	1.3	0.5-3.8	7
Russian European north, western and central Siberia	1.3	-0.1-3.7	20
Northeastern Siberia (including Chukotka and Kamchatka)	0.5	-0.5-1.9	24
Swiss Alps ^d	10.5	-1.8-31.6	9
Antarctica	0.1	-1.5-2.5	12

Smith, S. L., O'Neill, H. B., Isaksen, K., Noetzli, J., and Romanovsky, V. E.: The

changing thermal state of permafrost. *Nat Rev Earth Environ.*, 3(1): 10–23.
<https://doi.org/10.1038/s43017-021-00240-1>, 2022.

In the revised manuscript, we modified it to “northern Russian European, western and central Siberia”.

22) Both terms of “Qinghai-Tibet Plateau” and “Tibetan Plateau” occurred in the manuscript, I wonder if the authors think they could be modified to be consistent?

Response:

Thanks for the suggestion. In the revised manuscript, we changed “Tibetan Plateau” to “Qinghai-Tibet Plateau”.

Furthermore, we read through the context of the manuscript. We added three important references in the context. At the same time, we updated the reference list of the manuscript.

Line 49 and Line 608: Wang, D., Wu, T., Zhao, L., Mu, C., Li, R., Wei, X., Hu, G., Zou, D., Zhu, X., Chen, J., Hao, J., Ni, J., Li, X., Ma, W., Wen, A., Shang, C., La, Y., Ma, X., and Wu, X.: A 1 km resolution soil organic carbon dataset for frozen ground in the Third Pole, *Earth Syst. Sci. Data*, 13, 3453-3465, <https://doi.org/10.5194/essd-13-3453-2021>, 2021.

Line 49 and Line 626: Zhang, G., Ran, Y., Wan, W., Luo, W., Chen, W., Xu, F., and Li, X.: 100 years of lake evolution over the Qinghai-Tibet Plateau, *Earth Syst. Sci. Data*, 13, 3951-3966, <https://doi.org/10.5194/essd-13-3951-2021>, 2021.

Line 50 and Line 588: Shogren, A. J., Zarnetske, J. P., Abbott, B. W., Bratsman, S., Brown, B., Carey, M. P., Fulweber, R., Greaves, H. E., Haines, E., Iannucci, F., Koch, J. C., Medvedeff, A., O’Donnell, J. A., Patch, L., Poulin, B. A., Williamson, T. J., and Bowden, W. B.: Multi-year, spatially extensive, watershed-scale synoptic stream chemistry and water quality conditions for six

permafrost-underlain Arctic watersheds, *Earth Syst. Sci. Data*, 14, 95-116,
<https://doi.org/10.5194/essd-14-95-2022>, 2022.