

The Cryosphere Discuss., author comment AC1 https://doi.org/10.5194/tc-2021-191-AC1, 2021 © Author(s) 2021. This work is distributed under the Creative Commons Attribution 4.0 License.

## **Reply on RC1**

Yi Zhao et al.

Author comment on "Convective heat transfer of spring meltwater accelerates active layer phase change in Tibet permafrost areas" by Yi Zhao et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-191-AC1, 2021

Dear Reviewer #1,

We would like to thank you for these valuable comments and suggestions. They are really helpful in improving the quality of the manuscript. Following your comments, we have updated the manuscript in the following main points:

(1) We have provided the details of mathematical formulation of the SHAW model, as well as its pros and cons comparing to Painter et al., and discussed some other related studies.

(2) A new Discussion subsection has been added to explain how snowmelt convection affected the soil thermal regime during winter when soil layers were impervious.

(3) We provided more observed evidence about the impacts of liquid convective heat transfer (CHT) on soil temperature.

(4) Considering that CHT is not pronounced on the annual or monthly scale, we analyzed the numbers of the CHT occurrences and the average temperature variations caused by them to elucidate their effects on the soil thermal regime.

(5) We revised the manuscript extensively, rewrote many sentences and significantly improved the English writing.

We have included a supplementary response letter explaining what we have modified in response to each of your comments. Please refer to that for all details.

Thank you for your time and consideration.

Sincerely,

Yi Zhao, on behalf of the authors