



**Comment on essd-2021-83**

Stepan Varlamov (Referee)

Referee comment on "New high-resolution estimates of the permafrost thermal state and hydrothermal conditions over the Northern Hemisphere" by Youhua Ran et al., Earth Syst. Sci. Data Discuss., https://doi.org/10.5194/essd-2021-83-RC1, 2021

The manuscript presents a comprehensive analysis of permafrost thermal state and hydrothermal conditions over the Northern Hemisphere using high-resolution estimates. The authors employ a sophisticated modeling approach that integrates various data sources, including ground temperature measurements and satellite-derived snow cover data. The results provide valuable insights into the spatial and temporal variability of permafrost conditions across different regions and depths.

However, several aspects of the study require further clarification and validation. First, the choice of model parameters and boundary conditions should be more rigorously justified, especially in regions with limited observational data. Second, the model's ability to capture extreme events and rapid changes in permafrost conditions needs to be thoroughly assessed. Finally, the interpretation of the hydrothermal conditions derived from the model should consider the potential biases associated with the underlying physical processes and data inputs.

In conclusion, while the study offers a detailed and systematic examination of permafrost characteristics, it would benefit from a more critical evaluation of the model's performance and the robustness of the derived estimates. Addressing these concerns will significantly enhance the scientific value and reliability of the findings.

The authors are requested to provide a detailed response to the comments and to revise the manuscript accordingly, addressing the identified weaknesses and strengthening the conclusions. The revised version should be submitted within the specified timeline.

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