

Interactive comment on “Effects of variability of meteorological measures on soil temperature in permafrost regions” by Christian Beer et al.

Anonymous Referee #1

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The current version of the paper requires significant modifications and rewrites in order to be considered for the Cryosphere journal. I think that this paper is more suitable for Geoscientific Model Development journal and suggest to authors to consider that journal for this paper. Overall, it looks to me that authors promote usage of the dynamics snow and organic layer in the process-oriented models, which sounds more like advances in the model that authors employed in their work.

Authors state that climate variability mostly impacts snow depth and the upper soil organic layer (SOL). Authors call SOL as cover and thermal diffusivity of lichen and bryophytes. These different notations confuse the reader right from the beginning. First describe the lichen and bryophytes. Do not assume that readers know everything about them. Spend more lines on the description in the introduction and methods sections. What are their spatial coverage and thickness? Why are they so important?

Note, that SOL thickness and the level of saturation will determine soil temperature for the certain location and time.

In Abstract. Where is the 1K higher temperature come from? Is this temperature difference uniform for every geographic location? Statements like 'less-pronounced' in the abstract looks like a hand-waving to me. Please use exact numbers (statistics) when making any statements in the manuscript.

I suggest to review the corresponding literature and cite previous work appropriately in this study. For example, recent work summarizing the models inter-comparison on modeling of snow (Wang et al., 2016). Recent work stressing the importance of the organic layer and coupling of the soil biogeochemical processes in the land system models (Jafarov et al., 2016). Once again changes in the SOL heat diffusion properties directly correlate with the level of saturation of soil for a specific year (see O'Donnell et al., 2009 and many others).

In conclusion, there are improvement that has to be done through the entire paper. If resubmitted for the Cryosphere journal then the advancement in science has to be better stressed.

References

1. O'Donnell, Jonathan A.; Romanovsky, Vladimir E.; Harden, Jennifer W.; McGuire, A. David. 2009. The effect of moisture content on the thermal conductivity of moss and organic soil horizons from black spruce ecosystems in interior Alaska. *Soil Science*. 174(12): 646-651.
2. Jafarov, E. and Schaefer, K.: The importance of a surface organic layer in simulating permafrost thermal and carbon dynamics, *The Cryosphere*, 10, 465-475, doi:10.5194/tc-10-465-2016, 2016
- 3 Wang, W., Rinke, A., Moore, J. C., Ji, D., Cui, X., Peng, S., Lawrence, D. M., McGuire, A. D., Burke, E. J., Chen, X., Decharme, B., Koven, C., MacDougall, A.,

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Saito, K., Zhang, W., Alkama, R., Bohn, T. J., Ciais, P., Delire, C., Gouttevin, I., Hajima, T., Krinner, G., Lettenmaier, D. P., Miller, P. A., Smith, B., Sueyoshi, T., and Sherstiukov, A. B.: Evaluation of air–soil temperature relationships simulated by land surface models during winter across the permafrost region, *The Cryosphere*, 10, 1721–1737, doi:10.5194/tc-10-1721-2016, 2016.

[Interactive comment on The Cryosphere Discuss.](#), doi:10.5194/tc-2016-210, 2016.

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