Point-by-point response to referees

We thank the reviewer for the insightful and constructive comments. We have made point-by-point responses and/or revisions according to your suggestions and instructions. We recall the comments of the reviewer in black, followed by our reply in blue.

Responses to Referee #2

Report #2

Suggestions for revision or reasons for rejection (will be published if the paper is accepted for final publication)

It's my pleasure to review gmd-2020-142 "Assessing the simulated soil hydrothermal regime of active layer from Noah-MP LSM v1.1 in the permafrost regions of the Qinghai-Tibet Plateau" by Li et al. The authors have appropriately addressed my previous comments, and the paper can be accepted after addressing my following two minor concerns.

1. Since the authors have also tested the performance of Noah-MP in the other site, i.e., BLH site, it's suggested to briefly describe related conclusions in the Discussion part to highlight the transferability of key findings to the other site. The results related to the test in BLH site can be included in the Supplementary materials as well.

Response: Thank you for your comment. We already added the main findings at BLH site in the Supplementary materials. Also, we added some explanations in the Perspective part as follows:

"Further tests at another permafrost site (BLH site, 34.82°N, 92.92°E, Alt.: 4,659 m a.s.l) basically showed consistent conclusions with that at TGL site (see Supplementary files for details), indicating that relevant results and methodologies can be practical guidelines for improving the parameterizations of physical processes and testing their uncertainties towards soil hydrothermal modeling in the permafrost regions of the plateau."

2. I note that the liquid water in the top two soil layers are generally underestimated especially at the BLH site, is this related to the ignore of soil organic matter effect as evidenced by many other researchers such as Yang et al. (2009), Chen et al. (2012), and Zheng et al. (2015)?

Yang, K., Koike, T., Ye, B., and Bastidas, L.: Inverse analysis of the role of soil vertical heterogeneity in controlling surface soil state and energy partition, J. Geophys. Res.-Atmos., 110, D08101, 2005.

Chen, Y., Yang, K., Tang, W., Qin, J., and Zhao, L.: Parameterizing soil organic carbon's impacts on soil porosity and thermal parameters for Eastern Tibet grasslands, Sci. Chin. Earth Sci., 55, 1001-1011, 2012.

Zheng, D., van der Velde, R., Su, Z., Wang, X., Wen, J., Booij, M. J., Hoekstra, A. Y., and Chen, Y.: Augmentations to the Noah model physics for application to the Yellow River source area. Part I: Soil water flow, Journal of Hydrometeorology, 16(6), 2659-2676, 2015.

Response: Thank you for your insightful comment. Underestimation of topsoil moisture on the QTP is a common problem in many LSMs, which can be attributed to the poor representation of the complex soil profiles in current models (Yang et al., 2005). The missing of soil organic matter can be one of the reasons. However, some studies also illustrated the limited impacts of soil organic matter on soil moisture (Gao et al., 2015; Sun et al., 2017; Li et al., 2020) in both the plateau and other regions (Khlosi et al., 2013; Rawls et al., 2003). Moreover, many other studies highlighted the mucilage in the rhizosphere (Gao et al., 2015), the gravels (Yi et al., 2018), and the permafrost (Wu et al., 2018) in soil moisture simulation. It is worth quantifying the influence of these physics on the simulation of soil moisture in the future.

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Yang, K., Koike, T., Ye, B., and Bastidas, L.: Inverse analysis of the role of soil vertical heterogeneity in controlling surface soil state and energy partition, J. Geophys. Res.-Atmos., 110, D08101, 2005.

Yi, S., He, Y., Guo, X., Chen, J., Wu, Q., Qin, Y., & Ding, Y. (2018). The physical properties of coarse-fragment soils and their effects on permafrost dynamics: A case study on the central Qinghai-Tibetan Plateau. The Cryosphere, 12(9), 3067– 3083. https://doi.org/10.5194/tc-12-3067-2018

List of changes

1. Brief descriptions about the conclusions at BLH site in the Perspective part and detailed results in the Supplementary file.
2. Two co-authors were added for their contributions to this work.
3. Thanks to the supports of the National Natural Science Foundation of China (42071093), the CAS "Hundred Talents" Program (Sizhong Yang), and the National Cryosphere Desert Data Center Program (E0510104).