

# ***Interactive comment on “Lower boundary conditions in Land Surface Models. Effects on the permafrost and the carbon pools” by Ignacio Hermoso de Mendoza et al.***

**Anonymous Referee #1**

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This paper addresses a very interesting topic. The land surface components of Earth System Models usually make two fundamental simplifications in the model used for computing subsurface temperatures: 1) the geothermal heat flow is not taken into account, 2) the models have an insufficient depth extent to compute the effects of typical climatic thermal perturbations in the subsurface, without being affected by the lower thermal boundary condition. The effects, of both simplifying assumptions are addressed in this paper, focusing specifically on permafrost evolution and the storage/release of carbon in vegetation and soil. The subject of the paper is not new, as the authors acknowledge on page 2, but the effects have thus far hardly been quantified. However, the authors have not provided a full description of their permafrost/thermal

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model. Are phase transitions incorporated? Do they couple active layer thickness changes to the hydrology model? What is their definition of permafrost in terms of ice-water content? How are the blanketing and buffering effects of snow on the surface incorporated? Many such descriptions are missing. In addition, the authors assume a constant regolith thickness of a few meters, without porosity-depth changes, and a granitic bedrock to occur worldwide. Also, they assume a spatially constant geothermal heat flow. Both assumptions are very crude approximation of reality, which will severely affect their modelling results. Information on the global variation in subsurface composition and geothermal heat flow is available in literature and databases.

Please find more comments in the supplement

Please also note the supplement to this comment:

<https://www.geosci-model-dev-discuss.net/gmd-2018-233/gmd-2018-233-RC1-supplement.pdf>

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Interactive comment on Geosci. Model Dev. Discuss., <https://doi.org/10.5194/gmd-2018-233>, 2018.

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