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Interactive comment on "Numerical modelling of permafrost spring discharge and open-system pingo formation induced by basal permafrost aggradation" *by* Mikkel T. Hornum et al.

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We thank the reviewer for at very detailed, constructive and thorough review. The manuscript has been revised according to comments and suggestions made the referee.

The review of our manuscript clearly shows that the referee has studied our work carefully and evaluated it very professionally. We are pleased to see acknowledgement of the novelty of the pingo-forming mechanism we propose and that our research is well presented.

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Discussion paper

The reviewer is of the impression that the paper "gives the sense that the modelling work proves the conceptual model to be correct" and this leads to several specific comments on how limitations to the modelling mean it falls short of being able to provide such a confirmation. However, we did not intend to make such a claim, and merely wished to reveal the plausibility of our conceptual model through the modelling work. We therefore hope that our revisions make this message clearer. We also note that addressing the specific points raised by the reviewer have been of great value for improving our paper.

Some of the reviewer's critique concern the boundary conditions of the numerical models and she asks for data supporting our boundary selection. Despite the relatively extraordinary amount of relevant data available for Adventdalen, the boundary selection still relied on little information. As such, the boundary conditions are somewhat speculative and at best representative of one possible state of the investigated groundwater system. More data and greater certainty would be preferable, but we are left with this approach in lack of better options. This is a common challenge for modelling deep groundwater flow in permafrost areas (van der Ploeg et al., 2012).

Please see the supplement to this comment for a point-to-point answer to the referee's comments.

Please also note the supplement to this comment:
https://www.the-cryosphere-discuss.net/tc-2020-7/tc-2020-7-AC1-supplement.pdf

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