

Author's response

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1 Reviewer #5

The authors are grateful to the reviewer for their constructive comments. The current version of the manuscript has strongly benefitted from them. We now provide our answers (regular font) to the suggestions made by the reviewer (*italic*).

- *While the authors should organize their introduction as it best fits their vision, I would recommend beginning with an introduction to the importance and background of the ice temperature problem in glaciology, identifying the need for a new 1D transient solution, discussing the work done in other fields (e.g. what is currently lines 34-43 in the tracked-changes version of the manuscript), and ending with what the paper specifically aims to accomplish. Particularly given the focus of the journal, this would be the clearest way to set up the work presented in the rest of the paper.*

We agree with the suggested new order of the introduction and we have change it accordingly. The current introduction thus starts by stating importance and background of the ice temperature problem in glaciology. Then, the need for a new 1D transient solution is highlighted with a review of previous work done in other fields. Finally, the specific aim of the paper is presented.

- *Finally, as a small comment, I still disagree with some of the ranges presented in Table 1 – the Brinkmann number can certainly be larger than 5 (back-of-the-envelope calculations give reasonable values up to 50 and possibly higher), and if I’m understanding the authors’ response correctly, the lateral advection parameter was taken primarily from Dahl-Jensen 1989, which looked at a flowline near the summit of Greenland, and I’m not sure it’s clear that these are relevant magnitudes for fast-flowing glaciers in Antarctica. Even if the authors continue with these ranges, however, it would be valuable for them to include citations for all of these ranges, or an explanation (possibly as another column in the table) for how they arrived at these ranges.*

We have re-calculated the Brinkmann number by including higher strain rates from e.g., Meyer and Minchew (2013). As the editor suggests, values can be higher than 5 and Table 1 has been updated to reflect so. Moreover, following the reviewer comment, we have included an additional column in Table 2 with all references of those values that yield the non-dimensional parameter ranges. The lateral advection parameter is taken from two references: Dahl-Jensen (1989) and Funk et al. (1994). The former spans a variety of horizontal temperature gradients from the ice divide to the ablation region. The latter further describes the two-dimensional temperature fields applied along the central flowline of Jakobshavns Isbnfæ, West Greenland, and along a flowline through the adjacent ice sheet.