Geoscientific
Model Development
Discussions

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Interactive comment on "Extended enthalpy formulations in the ice flow model ISSM version 4.17: discontinuous conductivity and anisotropic SUPG" *by* Martin Rückamp et al.

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This manuscript describes the formulation of the thermodynamics-enthalpy solver in the ice-sheet model ISSM, including a novel numerical treatment of the discontinuous boundary between temperate and frozen ice within an ice column (known as the CTS). This problem is very important and relevant for ice-sheet modeling today, as more models begin to make use of the enthalpy formulation to simulate polythermal ice. I find the manuscript well written and clear. The methods, including new parameterizations applied here, and the results are straightforward to understand. The benchmark tests make the problem clear, and show the impact of the solution proposed by the authors.

C1

I therefore suggest that the manuscript be published with only very minor technical revisions.

Minor copyediting comments:

P1L10: are not accounting for => do not account for

P10L240: wen => when

P10L241: is flipping => flips

P11L245: symmetry reason => symmetry

P11L249: whole ice column => whole ice profile [I don't see oscillations within a given column]

P13L271: euclidean => Euclidean

Figures: consider using a different/darker color than yellow for the geometric mean points/curves. Since this is the novel result, it would be valuable for it to stand out a bit more in the figures.

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2020-78, 2020.