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Interactive comment on "Modeling the Greenland englacial stratigraphy" *by* Andreas Born and Alexander Robinson

Anonymous Referee #2

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This model presents a modeling of the Greenland ice sheet comprising a module for solving the age equation, which allows to compare the modeled isochrones with radar-observed isochrones. This age module is derived from the study of Born (2017), but it is now decoupled from the thermo-mechanical model used. The work of Born (2017) demonstrated how this new numerical scheme, based on the time domain, outperforms classical Eulerian schemes which show large diffusive artifacts.

This study presents itself as "the first three-dimensional ice sheet model that explicitly simulates the Greenland englacial stratigraphy". The ice sheet model used here is YELMO. The climate forcing used is based on two snapshots (Present-day and LGM) and a climate index based on paleoclimatic archives. A pseudo inverse method is used to fit a few parameters so that the model best fits either the present-day topography, the

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internal layering, or both. It is found that the model fitted onto the englacial stratigraphy gives a better overall fit than the model fitted onto the surface topography. So it is "easy" to have a model that fit the surface topography for wrong reasons.

The article is generally clearly written, and is a good contribution to the field of ice sheet modeling and comparison to observations. It certainly opens a new chapter of model-data comparison in ice sheet modeling.

My main comments are similar to the remarks of the first reviewer: I reckon that some sections are too detailed while others are not enough, so that the main output is too diluted to be easily accessible. I feel that the method section of the article describe in too much details the YELMO ice sheet model used and its climate forcing, instead of focusing on the new age numerical scheme and how the variable are transferred from the thermo-mechanical grid to the age grid. Then, the results section describe in details the fit of the model to the observations, while the inverse method used here is really basic and does not allow to explore the full parameter space. I would rather focus on the comparison of this new age numerical scheme with previous numerical schemes, like the Eulerian and semi-Lagrangian schemes. In short, I reckon the value of this article is more on the age numerical scheme than on the inverse method.

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