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comment

Interactive comment on "The Community Firn Model (CFM) v1.0" *by* C. Max Stevens et al.

Anonymous Referee #2

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Review of

The Community Firn Model (CFM) v1.0

by Stevens and others.

General

This is a laudable effort to synthesize efforts to model firn layers in a wide variety of climate conditions; the open-source model is expected to be widely used by remote sensing community (translating elevation change to mass change) but also by the regional climate modellers that aim at improving the representation of firn in their models, or simply as a standalone tool for process studies such as firn air age, pore close-off and the interpretation of firn gas records. The paper is well structured, clearly and concisely written and the figures of good quality. My comments are relatively minor.

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Discussion paper

General comments

l.87: Perhaps this is a good point to state specifically whether shortwave radiation penetration has been included (no), with a short motivation why (not).

l. 88: H-L is an explicit expression that directly produces a profile without the necessity of time stepping? Furthermore, assuming constant accumulation rate and surface temperature to spin up the model is not very realistic and will lead to a 'shock' once the real forcing data are applied. Is there an option to simply repeat the first (couple of) year(s) to spin up the model, to reduce this shock? This is done later in the application sections, but it would be worthwhile to already state that possibility here.

l. 440: Monthly time steps appear long, and ignore the impact of the daily cycle and the a-synchronicity of snowfall and temperature fluctuations; has it been tested how different the results look if daily or hourly time steps are taken?

l.541: Inferences are made about the possible reasons for the mismatch between the models and the observations. This ignores that fact that the forcing model data also are uncertain and responsible for part of the mismatch. It would be interesting to briefly explore this sensitivity (varying temperature by +/- 1 degree and accumulation by +/- 10%).

Minor comments l. 24: "The first zone is defined to include the firn from the surface density". This is unclear.

l. 105: models -> expressions (?) OK, explained later on, perhaps start with the explanation.

l.386: "the firn temperature is raised by an amount that equals the latent heat released by refreezing" Suggest to replace "equals" with "corresponds to".

l. 508: "The firn-core density data have high variability with depth" What causes these variations, surely not melt?

Interactive comment on Geosci. Model Dev. Discuss., https://doi.org/10.5194/gmd-2019-361, 2020.