

The Cryosphere Discuss., referee comment RC1
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Comment on tc-2021-274

Anonymous Referee #1

Referee comment on "Derivation of bedrock topography measurement requirements for the reduction of uncertainty in ice-sheet model projections of Thwaites Glacier" by Blake A. Castleman et al., The Cryosphere Discuss., <https://doi.org/10.5194/tc-2021-274-RC1>, 2021

Castleman et al 2021

This paper present ice sheet model simulations of Thwaites Glacier, Antarctica, and specifically investigates the potential impact of bedrock elevation uncertainty in future projections of this ice stream's future evolution. The manuscript is well written, clear, and will be of interest to the glaciological community. The model employed is state-of-the-art, which lends credence to the findings. The authors conclude from their experiments that ice sheet topography needs to be constrained to no greater than 2 km in the horizontal, and 8 m in the vertical. This presents a target (and a challenge) for future geophysical campaigns.

l42 - perhaps use '0.59' to avoid it being misread (same applies elsewhere, e.g. l146, l257)

l61-2 - 'nearly impossible...using simplified parameterizations' - I think by virtue of them being 'simplified' that implicitly means that not all oceanic processes are being represented, right? I would just say, 'simplified parameterizations does not capture oceanic processes well', or something like that.

l62-3 - might be worth mentioning ISMIP6 results here perhaps? Seroussi et al., 2020, Edwards et al., 2021. They show considerable spread, some of which arises from the basal melt rate parameterization. See also IPCC AR6 Chapter 9 (Fox-Kemper et al., 2021).

l80 (& 82, 83, 86 etc) - 'errors', or 'uncertainties'? Isn't the point that we don't *know* whether the interpolations are accurate or not? Do we know for sure they are 'wrong'? I realise that 'statistical error' has a specific meaning, but from the perspective of clarity, might be worth considering alternative wording for at least a few instances of this, where appropriate.

l303 - Just a question - is there anything in the surface DEM that could help constrain where 'unknown' bedrock features might be present? Usually we see a surface expression of bedrock rises.

l655 - 'highly critical' - surely just 'critical' would do, or just, 'important'?

Fig 2 - GL positions are very hard to distinguish, make thicker perhaps, or put a thicker white line underneath each of the coloured lines?