We thank the editor and reviewers for their comments and feedback during this process. The editors comments are in *italics* below, with our response in normal text.

*Dear Jim and co-authors,*

*Thanks very much for uploading the full revised manuscript. I'm happy to recommend your manuscript for publication submit to some minor edits and further review by me.*

*I note that reviewer 1 had very minor concerns, and I'm convinced that you have addressed them sufficiently.*

*I also agree with your point that some of the concerns raised by reviewer 2 are more appropriately addressed in a future CalvingMIP paper that specifically addresses the quandary around calving laws, rather than in this one on algorithms.*

*However, there is one point that should be further revised: the statement that "If a model is able to accurately represent a continuous, time-varying rate of retreat then it should also be able to represent a single discontinuous calving event" is not obvious to me, although I could be misunderstanding the numerics.*

*For front-advection schemes such as level-set methods, my understanding is that a discontinuous calving event that moves the front by some distance, L, gives a Courant number of approximately L/Δx (Δx is the grid cell size) in the step in which it occurs, independent of the timestep, so any event larger than about one grid cell would violate the CFL condition. I understand then that this might require a different implementation from the one used for continuous calving, although that depends of course on the numerics. The timing of the calving might also present a problem if an event triggered between timesteps would be applied up to one timestep late. Then the geometry could be in error by the full magnitude of the calving, rather than by the small increment typical of continuous retreat – would this affect the results? Also, the order in which calving is applied within a timestep (e.g. solve velocity → update thickness → apply calving, versus apply calving → solve velocity → update thickness) might have a different effect for a discrete event than for continuous retreat, because the loss of buttressing can produce a large velocity change within a single step.*

*So then I'm wondering if the ability to represent discontinuous events does indeed follow directly from the ability to represent continuous events? I would therefore recommend to slightly edit the paragraph starting new line 63, and justifying or softening the claim that it is the "harder technical challenge".*

To clarify the intent behind the statement, this was referring to seeing continuous calving as the limit of applying a discontinuous calving event every time step. As an example, the initial imposition of a calving front can be thought of as one such event, and models were able to match this location to a high degree of accuracy much earlier in the lifetime of the project than they were able to match a given retreat rate. However, our experiments have not tested whether the algorithms break down for large retreat rates that would be needed to simulate a large discrete calving event within one time step. From personal experience with Ua and Kori, I have not tested them with a retreat beyond ~5km/a. I have not personally encountered any

noticeable differences when having a 5km/a retreat rate and a 2km resolution, but I cannot categorically say no issues would arise.

In regard to the point about where exactly in the time step the ice lost due to calving is removed, I believe that both approaches discussed here, both level set and fractional area, represent this by modifying the ice shelf melt rate field, either to remove all ice beyond the LSF calving front contour, or to translate a horizontal calving rate into an equivalent amount of vertical melting. To the best of my knowledge, all models presented here would therefore apply their calving at the same time as the update thickness step. Whilst there remains concerns about how this would impact the results, I don't think this is significantly different than for melting. I will admit that the scale of any differences are likely to be larger, due to the relative amounts of mass loss due to melting in a given timestep and the amount of mass loss due to a large discrete calving event in the same timestep.

As such, I have removed the reference to "harder technical challenge" and added the following text to incorporate some of my above response into the main paper.

Line 224 - "Both approaches will typically remove ice during the update ice thickness part of a time step, similarly to how ice melting and precipitation are applied."

Line 549 - "Due to the nature of our experimental design and focus, we have not explicitly tested these approaches with large scale, discrete calving events occurring over a single time step (for example, calving 100 km of ice in a single time step). It is possible that there may be a loss of accuracy or other unforeseen issues if these algorithms are used in such a fashion, though it should be noted doing so was not their initial intended use case."

*Specific comments:*
*L27: "Antarctic Ice shelves" → "Antarctic ice shelves"*
*L41: "no particularly law was seen to" → "no particular law was seen to". Could mention that Wilner does point to eigencalving and von Mises laws as best reproducing observed calving front positions*

Text updated to the following.

"Some existing calving laws have been evaluated across glaciers in Greenland (Choi et al., 2018) and Antarctica (Wilner et al., 2023) in a single model and, although no particular law was seen to consistently reproduce observed calving fronts, eigencalving and von Mises were found to be the best performing calving laws (Wilner et al., 2023)."

*L402: "results in the comparatively low" → "results is the comparatively low" (I think?)*

Correct, changed to results is.

*L408: "providing it's front" → "providing its front"*

Changed.

*L453: closed parenthesis missing after Fig. 5*

Changed.

*L552: closed parenthesis missing after Fig. 3*

Changed.

*Best regards,*
*Felicity*