

Review of “The Open Global Glacier Model (OGGM) v1.0”
by Maussion et al.

General Comments

The study describes a new open source global glacier evolution model named Open Global Glacier Model (OGGM) that is written in Python. The paper is very well written and provides a good balance of model details and examples in addition to descriptions of model limitations and areas of future work. One of the best attributes of the model is its modular framework, which should help facilitate a comparison of how different aspects of the model impact the results, and as the authors state, will help answer many questions about global glacier modeling like what amount of modeling complexity is just right. The model also fills a major gap in the global mountain glacier modeling community as an open source community-driven model currently does not exist like those in the ice sheet community. In my opinion, the pre-processing tools alone will be a very valuable contribution to the mountain glacier community and the modular framework should enable the model to be community-driven. For these reasons, I recommend accepting this paper with minor revisions.

These minor revisions mostly deal with grammar and making a few sections a bit easier to understand. Additionally, the authors use the term “calving” throughout the manuscript, which might be better replaced by the term “frontal ablation”, which includes calving and other mass loss processes that occur for marine/lake-terminating glaciers. Lastly, the authors state that the model is intended to be community-driven and identify many places in the manuscript where future work/modules will be developed; however, there does not appear to be much discussion of how users in the community outside of the model development team could contribute to future model development. This does not have to be discussed in detail, but I would encourage the authors to add a few lines to Section 6 about how they envision users who are not affiliated with the OGGM team to be able to contribute new modules. Specific comments are detailed below.

Specific Comments

P refers to page

L refers to line number

Italics indicate suggested grammatical changes

P1 L2 – Delete “of” to read “Despite their importance...”

P1 L2 – “... and *being a* source of geohazards...”

P1 L12 – Delete “a” to read “the model shows very realistic behavior”

P1 L16 – “... added to the codebase, *which allow* new kinds of model intercomparisons *to be run* in a controlled environment ...”

P1 L18 – The future developments describe new physical processes and model calibration, but what about other community-driven efforts that perhaps have not been thought of yet? Perhaps a phrase could be added acknowledging these other unforeseen developments.

P2 L12 – “... improve the knowledge *of* how glaciers ...”

P2 L20 – comma after unfortunately can be deleted

P3 L21 – Use of a comma instead of apostrophe for number of inventoried glaciers?

P3 L26 – I would recommend using “frontal ablation” instead of “calving” (see general comment).

P4 L2 – Perhaps future improvements and new modules? See general comment about community-driven model, but I think there could be value in adding various modules that model mass balance or glacier dynamics in different ways.

P4 L4 – Why “the” Tasman Glacier? Is it always referred to in literature as “the Tasman glacier”? If not, then the can be deleted.

P4 L23 – In the current form it appears that the mass balance model and the glacier evolution are completely separate. Is that the case or does the model compute the mass balance for a given timestep (month, year, etc.) and then allow the glacier evolution to occur? If it is the latter, then I would suggest stating how the mass balance and glacier evolution are linked in the model.

P5 Figure 1 – Difficult to see the difference between c and d. Do c and d have a scale bar? Is this the scale bar associated with e and f? Or are the color of all the transects associated with the scale bar next to f? I assume the latter is the case, but perhaps explicitly stating this in the caption could be helpful.

P6 L26 – What do you mean by “because of the lack of traceability”? Do you mean that the dates when the DEMs were acquired or the data they were generated from are unknown?

P7 L3 – Is there a reason for the spatial resolution of the target grid varying for each glacier, but then the Gaussian filter being applied at a constant 250 m radius? If the grid size is varied, then why is the filter size not varied as well?

P7 L8 – “... because it allows *one* to compute centerlines and define...”

P7 L11 – “... minor role *compared* to ...”

P7 L14 – I’m a bit confused by the default grid spacing. Is this still a 2d “grid” or is this now referring to a “line” spacing of the transects. Also, does map topography refer to the resolution of the DEM? Is this the same spatial resolution of the target grid (P7 L1)?

P7 L20 – Why is this necessary? Is this done to avoid sinks, to ensure that each flowline only has a single flux upstream contributing to it (although at glacier branches there would be multiple anyways), or is this done to reduce problems associated with the ice thickness inversion? Please clarify.

P7 L26-32 – Are these the same steps as those associated with Figure 1? I would like to note that each step is much easier to visualize here in Figure 2.

P7 L31 – “... of the glacier is *the* exact same...”

P9 L5 – the global precipitation correction factor is a constant of 2.5 according to Appendix A. Since it does not vary regionally, I would recommend stating its value here as well.

P9 L9 – Does μ^* have a name?

P9 L15 – “... justifies describing it here.”

P10 L7 – How far away can this be? Is there a limit for how close these 10 locations need to be? Could you add the largest distances for example?

P10 L8 – reference Figure 3 when describing Hintereisfener

P10 L11 – Since the residual bias is subtracted from the modelled mass balance, should this residual bias be added to equation 1? Any information on what percentage of glaciers this is required for? If it's a small percentage, then perhaps it's not important to include in equation 1.

P12 L10 – change comma to decimal point

P13 L11 – “The equation varies *by* a ...”

P13 L22 – Can this overestimation be quantified or is it so reliant on the creep parameter that it doesn't make sense to add a range of values here? If it can be quantified (perhaps only for the default value), then it would be nice information to include.

P13 L32 – “is consequent” doesn't really make sense. I would suggest not negligible, sizable, noticeable, impactful, or something similar instead.

P14 Figure 6 – The order of (a) and (b) in the captions comes after they are described, while in Figure 5 they come before the subfigure is described. I would change these to be before in order to be consistent throughout the figure captions.

P15 L15 – What does “translate in a certain h” mean? I assume it means that a new h is calculated? Furthermore, “allowing to have” also sounds awkward. Perhaps “which allows” or “which enables” various bed geometries to be present along the same flowline?

P15 L28 – Consider using advancing instead of growing, since in this case the changes to the downstream flowline enables the glacier to advance as opposed to simply growing, which could refer to a glacier that is only increasing its ice thickness and not advancing.

P17 L4 – “*They* are considered...” and “e.g.” can be deleted.

P17 L14 – “... a valley glacier is *the additional* mass loss *that occurs* at the ...” See general comment about frontal ablation instead of calving as well.

P18 L3 – “... has the advantage of *preventing* tidewater glaciers *from advancing* while ... they stop *calving*.”

P18 L20-22 – These sentences refer to the RGI polygons, but these polygons are partially covered in Figure 7. Is it possible to make the polygons clearer?

P20 L6 – Perhaps “section” instead of “chapter”

P22 L21 – “most largest” doesn’t make sense. I recommend deleting most.

P22 L24 – “... size slope, *and* continentality”

P22 L28 – What is meant by “strike out”? Please clarify.

P22 footnote – Perhaps use “we note” instead of recall

P23 Figure 10 – specify that VAS is referring to volume area scaling as the others have been described.

P25 L31 – “allows *one* to switch”

P25 L33 – Here is another opportunity where perhaps you could state that the interested person could also contribute to the development of new modules as well to reinforce that this is meant to be a community-driven model? See general comment.

P26 L8 – “allows *one* to compare”

P27 L15 – “we recommend *using* Linux”