Summary and comments on the revised manuscript entitled

Impact of frontal ablation on the ice thickness estimation of marine-terminating glaciers in Alaska

first presented on 10.12.2018
by

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Recommendation

The authors have put much effort in adjusting the code and revising the manuscript in response to the second review round. I highly appreciate these changes and I am sure that the manuscript did gain in clarity. I am therefore only left with some few last minor comments and suggestions, which the authors should address before the article is considered for final publication.

Specific comments & suggestions

P6L14 Check the units of the sliding parameter. I think that they should be $m^2 s^{-1} Pa^{-3}$.

P8L7 Please remove the k-value as given by Oerlemanns & Nick (2005). It gives rise for confusion later on where you mention default values (P10L21).

P9L18-19 Please remove the first argument against implementing an analytical solution because the history of the review process will not be visible to a wide audience.

P10L5-10 You should remember the reader about the calibration of the calving factor k in Sect. 2.3. This calibration defines the default values for k, A and f_S. Give their values or refer to Table 1.

P10L28-32 I think that it is if high interest to further expand on the Columbia Glacier case study. Please also compare your results to the 'consensus estimate' of glacier ice thickness from Farinotti et al. (2019). Is there a qualitative difference? This is not a lot of work. Just add an extra line in Fig. 4c and add 2-3 sentences of explanation. To put this comment in a question: Why should we prefer the OGGM thickness values over the consensus thickness estimate for marine terminating glaciers in Alaska?

P11L30-P12L3 This passage is confusing because it evokes alternative choices in the methodology, which were not pursued. Please consider to transfer it to the methodology or remove it.

P12L29 I understand that you define the equally good parameter sets on the basis of Fig. 7. From Table 1 , I see the following ranges: A from 2.4 via 2.41 to 2.7 $10^{-24}s^{-1}Pa^{-3}$, k varies between 0.63 and 0.67, and f_S is only turned off and on. The creep parameter$A$ is therefore only increased. Are the two values 2.4 and 2.41 different settings? Why did you not decrease this value. The MacNabb frontal ablation uncertainty would allow a total range of roughly 1.5 to $4.010^{-24}s^{-1}Pa^{-3}$. The sliding parameter f_S is only decrease to zero, which hardly affects the frontal ablation (as visible from Fig. 7c). Again, the associated uncertainty in frontal ablation would allow a larger range up to $20.010^{-18}s^{-1}Pa^{-3}$. Finally, the k-range seems very narrow. You only use the two calibrated values for the cases with and without sliding. Again the frontal ablation range from MacNabb et al. (2015) would allow a range from 0.5 to 0.75. In summary, the question is why you chose such a narrow and selective parameter range? Please motivate your choice or adjust.

P12L29-P13L6 I do miss a description of the sensitivity results due to changes in all parameters. You only say that the creep and sliding parameters are most influential. What is the relative effect on regional ice volume. From Fig. 8, I loosely infer ±5%. How does this sensitivity compare to the uncertainty of other reconstruction approaches. The 5% value seems optimistic and it is certainly linked to your choices of the parameter ranges.

P13L15 Most parts of the discussion section focuses on the importance of correct geometric information near the glacier terminus. This is certainly valuable but I think you should use this section to also compare your approach with other reconstruction estimates (e.g. Farinotti et al., 2019). In my view, your results will show a clear improvement. Moreover, you should also discuss the choices you made in the sensitivity analysis.

P14L6 What errors do you refer to here? I think you refer to the width and depth correction that is described thereafter.

P15L14 Remove the parenthesis and reformulate. This information is decisive for the sentence.

Fig. 4c Could you add the result for Columbia Glacier from Farinotti et al., (2019) in panel (c). It is of great interest to the community how their consensus estimate does perform on tidewater glaciers.

Fig. 5b The sensitivity of the inferred μ^* on the calving factor k indicates that μ^* is set to zero for most of the smaller glacier (¡100km2) even for the default k value. This issue needs discussion in Sect. 5.