

Review of “Simulated retreat of Jakobshavn Isbæduring the 21st century”

1 Summary statement

The new version of the manuscript “Simulated retreat of Jakobshavn Isbæduring the 21st century” by X. Guo and colleagues addresses most of the comments raised by the three reviewers, presents a more nuanced view of the model’s ability to reproduce the evolution of this outlet glacier as well as its limitations, and provides more information to better put these new results in the context with previous studies.

The text is sometimes confusing, especially in the abstract and does not clearly state the results in terms of what are the new parts revealed by the study, and what confirms previous results obtained by earlier studies. This should be better emphasized in the text.

2 Major comments

Overall, it is not always clear when this manuscript agrees with previous studies, and when it disagrees or new elements are demonstrated by this new modeling study. It would be good to more clearly distinguish and compare with previous papers.

There is a hypothesis made on p.9 (l.156) about the correlation between the sea ice and the flow speed near the terminus. There is no clear assessment of or conclusion about this hypothesis later on the paper. It would be useful to validate it (or not) in light of the modeling results obtained in the manuscript.

Is the initial state chosen of the model (representing a combination of datasets taken at different time but close to 2009 followed by a relaxation with zero SMB but some sub-shelf melt) close to the 2004 conditions (p.12 l.225)?

There is no crevasse depth in the Von Mises tensile criterion (p.29 l.487), so the comparison made between the results obtained with a crevasse depth criterion and the Von Mises tensile stress criterion is not accurate, and needs to be improved.

It is explained that the winter calving happens late in the winter season, “when calving front height is at its annual minimum and presumably at its least vulnerable to structural failure”. I don’t understand why calving would happen during this period if ice close to the front is “least vulnerable” during this period.

3 Technical comments

p.1 l.13: rephrase, not clear

p.1 l.20: rephrase, not clear

p.3 l.44: Are you talking about the “ice mélange” in front the ”ice front” or about the “ice tongue” in front of the ”grounding line”. The ice mélange does not below to the glacier and its length varies a lot seasonally, so I don’t understand how Jakobshavn ”had a ~ 15 km long floating ice mélange. Please rephrase.

p.3 l.47: [?] esimated the basal melt rate, not the thinning rate.

p.5 l.88: the ocean does melt the ice, which is only one process by which the ice can thin.

p.5 l.93: “method” \rightarrow “results”

p.6 l.106: only the ice tongue is in hydrostatic equilibrium

p.8 l.148: “fjord” \rightarrow “fjord waters”

p.12 l.217: “was” \rightarrow “is to”

p.12 l.236: “velocities” \rightarrow “velocity”

p.14 l.262: “multiplying by” \rightarrow “multiplying it by”

p.20 l.340: What does ”higher” mean? Please rephrase.

p.23 l.372: ”produces” \rightarrow “produce”

p.29 l.487: there is no crevasse depth in the von mises tensile stress criterion.

p.30 l.510: “further extend a further” \rightarrow “further extend”

p.31 p.531: The MICI depends on the ice thickness, and I don’t think there is any consideration of season in its parameterization.

p.32 l.565: rephrase, not clear.

p.32 l.567: “Retreat slows” \rightarrow “Retreat will slow”