

Authors' reply to second round of referee comments on "21st century fate of the Mocho-Choshuenco ice cap in southern Chile" (tc2020-296)

Matthias Scheiter, Marius Schaefer, Eduardo Flandez, Deniz Bozkurt, Ralf Greve

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In the following, we address the minor revisions of the anonymous referee that provided feedback to our revised manuscript. We thank the referee for taking the time to carefully review our manuscript a second time and for providing another set of helpful comments. Apart from the changes outlined here, only minor additional corrections were made, as can be seen in the 'track-changes file'.

1 Anonymous Referee #1

I think this is a very and thorough revision of the study and manuscript. I see that the major changes are an updated surface mass balance parameterization and also a transient spin up to capture the ice cap's modern disequilibrium. Thanks for taking the time to carefully address these points (which I note the other reviewer raised as well), and nice work integrating them.

The adjusted methods and the reasoning behind them are described well, and I think the new figure panels will help the reader evaluate the model calibration and spinup. Based on these figures/analyses and the updated projections, I agree with you that the model seems to better capture the recent state of the ice cap – and that lends more confidence to the projections

I have just a few remaining comments, which are mostly minor questions of clarity or wording. Hopefully these will be quick to address.

I support publication of the revised manuscript. I think it will make a nice contribution both as a case study for glacier change in this region, and a useful demonstration of applying a 3D ice-flow model to a mountain glacier/ice cap setting.

Response: *We thank the reviewer for the positive feedback and are happy that our changes seem to have satisfied their previous criticisms.*

7: "exposition" – consider changing to aspect, which I think is more familiar and also used later in the manuscript

Response: *Changed.*

26-27: "apart from ice dynamics..." – consider re-wording; somewhat confusing to separate these with "apart from", as ice dynamics relate the climate forcings to glacier change

Response: *Sentence changed to 'In addition to climate forcings, other important contributors to glacier change in the region are ice dynamics and frontal ablation'.*

97: I assume the altitude is the (evolving) ice surface elevation, but perhaps you could specify

Response: *'Altitude' changed to 'evolving ice surface elevation'.*

134: I think estimating the local warming since 1979 based on both radiosonde and reanalysis is a good approach. This isn't a criticism, more of a comment: I was just surprised to see it is only a 0.2 C warming – much less than the global average over this time. Could be worth pointing that out in case readers have other regions with stronger recent warming in their minds.

Response: *Clarified by changing ‘long-term temperature trend’ to ‘long-term regional temperature trend’.*

136-37: I’m a little confused by this description – shouldn’t the ELA be lowered to make the 1979 steady state?

Response: *‘elevating’ changed to ‘lowering’.*

152: model » models

Response: *Changed.*

176: “of availability of...” – suggest changing to “where both the ELA and... are available”

Response: *Changed.*

Fig. 6: I assume this is for the present day (transient) state, not 1979? Consider stating to clarify.

Response: *Has been clarified by stating that it is the ice cap state of 2013.*

224: suggest “until 2100” » “by 2100”

Response: *Changed.*

256: “ice loss accelerates” – this is thickness change, right? I think I understand what you mean, but consider clarifying as this seems at odds with earlier statement about how the mean curves flatten by 2100 (229).

Response: *Clarified by changing ‘ice loss clearly accelerates in the second half of the century’ to ‘ice loss clearly accelerates between 2040 and 2080’.*

309: “dynamical processes” – consider wording to “dynamical state”? Or transient state? The spinup to me seems more about capturing the state rather than new processes.

Response: *Clarified by changing ‘the calculated times indicate that the most important dynamical processes of the ice cap are found to be captured by our model’ to ‘the calculated times indicate that the most important features of the transient state in 2013 should be captured by our model’.*

332: Opposed » as opposed

Response: *Changed.*

342: suggest “climate” rather than “circulation” for consistency

Response: *Changed.*

364: of advantage » advantageous

Response: *Changed.*

370: Drawback » a drawback

Response: *Changed.*

378: few » a few (??)

Response: *After looking up the difference between ‘few’ and ‘a few’, we decided that ‘few’ conveys our message better and have therefore kept it.*