The Cryosphere Discussions

The Cryosphere Discuss., referee comment RC2
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Comment on tc-2021-31

Anonymous Referee #2

Referee comment on "Brief communication: Do 1.0, 1.5, or 2.0□°C matter for the future evolution of Alpine glaciers?" by Loris Compagno et al., The Cryosphere Discuss., https://doi.org/10.5194/tc-2021-31-RC2, 2021

Review of Brief communication: Do 1.0°C, 1.5°C or 2.0°C matter for the future evolution of Alpine glaciers? by Loris Compagno, Sarah Eggs, Matthias Huss, Harry Zekollari and Daniel Farinotti [The Cryosphere Discuss. doi:10.5194/tc-2021-31]

General comments

This brief communication presents model results from GloGEMflow for all glaciers in the Alps under forcing scenarios that project approximately 1.0°C, 1.5°C and 2.0°C warming until the end of the century, to cast light on what difference these different warming levels will have on the future of the Alpine glaciers. The experiments are well designed, model setup that has been used previously is applied for this specific study, and the conclusions drawn are interesting. The impact on glacier volume and glacier meltwater runoff in the European Alps is quantified and shown that even under 1.0°C warming about half of the glacier volume will be lost and with an additional degree of warming more than 80% may be lost. The authors emphasizes that every half a degree of warming counts when discussing the future of the glaciers. Further, simulations with same model beyond 2100 with strong mitigation scenarios indicate that a slow recovery of the glaciers in the European Alps may happen but authors call these preliminary results and urge that projections beyond 21st century will be analyzed. The paper is clearly written, and the conclusions are clear, some minor comments for improvements are suggested below.

Specific comments:

The abstract is very brief and only hints at the results and conclusions. Suggest to include the quantification presented in the conclusion also in the abstract and clarify what "glaciers might start recovering" actually mean, when does the recovery start (same for all scenarios)? What does recovery mean (full, partial)? Why do they recover? The abstract should really entice the reader to read on so in my opinion more information already here would be useful.

Technical corrections:

Page 1, Abstract, Line 5, suggest to edit "temperature targets" with "scenario" or "projections resulting in different temperature change". Suggest also to clarify what "implications" and what "changes" are meant, by adding a little more text this sentence would be more informative.

Page 1, line 8, suggest to delete "need to"

Page 1, line 12, sentence is not clear, what is ambitious about the targets? What important environmental change is to occur? My suggestion would be to write out what

specifically is meant hear.

Page 1, line 21-22, suggest to clarify what "integrated response of climate forcing over decades to centuries" means here. Why is it integrated? What is the time scale? Why decades to centuries?

Page 2, line 26, suggest to clarify what "tease out" means and how the authors "do so"

Page 2, line 53, would be helpful to state what the 0.1° resolution is in km. It it further not clear how the climate is downscaled to the glacier scale, some explanation or statement of how the mass balance (at one point or several) for each glacier is computed.

Page 3 line 1, here would also be useful to state that the "coarse" resolution is in km

Page 3, line 65-66 suggest to turn sentence around, it would be the modelled loss that is close to the observations, rather than the other way

Page 3, line 68, suggest to add "global" between "century" and "warming", also would be useful to tell which scenarios those are (it is given a few lines below, my suggestion is to move that information to this location)

Page 3 line 75, is it also averaged? How are the grid cells used to produce SMB for each

glacier?

Page 3, line 80 it is not stronger for all three, only for the higher two, the first is decreasing from 0.98 to 0.96, suggest to edit the sentence

Page 5, line 107, suggest to edit/replace "results anticipate" with "simulations project"

Page 5, line 109, suggest to edit "is well documented" with something like "projected in other studies" or "established"

Page 6, line 115, not clear whether the three GCM members are same as in the previous simulations, "re-run" indicates that, but it could be clarified. If the are same then "extend" would be clearer. Maybe this information could be added?

Page 6, line 120 suggest to edit "re-gain a total volume that is between 47% and 72% of the 2020 level", the regained volume is the other part of the 2020 level (53% and 28%), so the sentence in not clear, can it be made clearer? How much is regained?

Page 6, line 122, it is not clear what "perception of an irreversible trend" is, maybe that could be stated, is the perception that the mass loss is irreversible? Where would that perception come from?

Page 6, line 123, suggest to replace “verifying” with “verify”

Page 7 line 125, this sentence is not clear, what is “decisive acting”? what are “unwanted consequences”? where is the “overwhelming consensus”? suggest to turn sentence around the temperature target (rather than “climate target”)

Page 7, line 128, suggest to replace “showed” with “show”

Page 7 line 131, suggest to replace “would” with “will”

Page 7, line 135, edit sentence, it is not the changes, but rather the peak runoff that occurs 1 to 2 months earlier. Suggest also to replace “anticipated” with “projected”

Page 7 line 136, suggest to add “peak” between “August” and “runoff”

Figure 2. Why is there a bed upwards (kink) for +2°C (red line) at 2020?, less for the +1.5°C (light blue line) and downward dip that goes up for the +1°C (blue line) is this due to the transition from the E-OBS to CMIP6 models? This could be discussed in text. Caption, line 3, replace “or” with “of” and suggest to add that the (n) is given in panel (a).

Supplementary material Figure S2, Delete “annual” in figure title after “winter”

In figure captions of S1 and S2 suggest to replace “of 72 glaciers” with “from 72 glaciers”

Suggest to edit figure caption S3 it is not only Modelled glacier evolution until 2300 but also temperature and precipitation evolution.

Table S2.1 replace “and” with “an” before “area” something strange in the parenthesis what does (given as “Area??) refer to?