Review of

Brief communication: Do 1.0°C, 1.5°C or 2.0°C matter for the future evolution of Alpine glaciers?

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Summary:
This paper aims to assess the influence of mitigating global climate warming less than 2.0°C on Alpine glacier evolution and its related water resources. This goal is achieved by modelling the glacier surface mass-balance and ice dynamic using the glacier model GloCEMflow, forced by temperature and precipitation extracted from CMIP6 experiments (global climate models) and calibrated against *in situ* mass balance observations. Results can be nicely summarized by this words: **for Alps glacier changes and their consequences, every half-degree counts**. In order to maintain a certain amount of glacier ice volume in the European Alps (19% +- 8% for 2°C of global warming in 2100 compared to pre-industrial values and 56% +- 21% for 1°C), important mitigation strategies are needed. Furthermore, annual average runoff over glacierized catchments will decrease between 25% +- 6% and 36% +- 10% depending on the global warming target, and peak seasonal water will be advanced by 1 or 2 months.

General remark:
Overall, the paper is well presented, English is clear and the work done is robust, with a high scientific rigour and with a clear and concise message. Data and model are clearly presented and the methodology seems to be the good one to reach the study goal. I thus think the article deserve publication, especially for its importance and impact on policy maker debates about their procrastination to act for maintaining global warming under certain temperatures (The Paris Agreement in 2015).

One downside is the moderate originality of the study. Indeed, glacier volume decrease for different global warming targets has already been studied at global scales (e.g. Marzeion et al., 2018, or SROCC report, 2019), thus including the European Alps, and this study does not improve too much the expected regional results but confirmed them (see also Zekollari et al., 2019). However, that's the first time that CMIP6 experiment outputs are used to drive the glacier model.

Finally, we could also imagine other interesting studies within the framework and method used here (even if that's out the scope of Paris Agreement): how the European glaciers will evolve for higher global warming targets ? does the half degree between 1°C and 1.5°C count as the same manner as the half degree between 3°C and 3.5°C ? how many years do we have until actual committed glacier mass loss become similar to the different global climate warming targets ? what are the spatial patterns of future climatology over the European Alps glaciers and at finer scales, and how those patterns will affect glacier evolution ?

Specific comments:

- **line 8 to 31:** I think references to SROCC, 2019, and GlacierMIP2 papers are missing. In addition, one or two sentences could be useful to explain why you are using this model instead of OGGM (Maussion et al., 2019) or PyGEM (Rounce et al., 2020) for example.
- **line 48 to 51**: for water runoff calculation, you do not take into account rain which is outside glacier outlines but at higher elevation than the glacier front (for example other part of the mountain catchment area which are not cover by ice), neither snow melt outside the glacier (but likewise at higher elevation than the glacier terminus). How this will affect the runoff estimates you are calculating ?
- **line 52 to 58**: there is a certainly a lack in the representation of spatial variations of temperature and precipitation over the mountainous Alpine region with the GCMs used. How this will affect the results ? Why not having used RCMs do downscale the data ? Or used other regional climate forcing such as EUROCORDEX ensemble ?
- **line 63**: how can you explain the relatively high RMSE and low square correlation coefficient whereas the bias is low when comparing glacier-wide mass-balance between GloCEMflow simulations and the 72 WGMS observations ?

- **line 58 to 67**: evolution of glacier volume change can also be compared with Zekollari et al., 2019, and Marzeion et al., 2020 (Partitioning the uncertainty of ensemble projections of global mass change), even if both studies do not target specifically 1.0°C, 1.5°C and 2.0°C global climate changes, and that the second study is global. Comparison with the study of Zemp et al., 2019: they found 2 092 km^2 of glacier area in the region 11 (European Alps), multiply by 0.97 . 10^{-3} km.we.yr^{-1} (0.87 . 10^{-3} / 0.9 ice density = 0.97 . 10^{-3}), it gives 2.029 km^3.we.yr^{-1} of mass loss per year. Thus, over 20 years, it results to 40.585 km^3 glacier mass loss and finally only over Switzerland (60% of the Alps ice volume), it gives 24.35 km^3 glacier mass lost during the last 20 years which is also very close to what you found ! Are my first order calculation right ?
- **line 88 to 91**: you do not discuss that large part of glacier mass in the Alps is already committed to melt because actual temperatures are already largely higher than pre-industrial values ?
- **line 92 to 93**: authors explain the different remaining glaciers in 2100 for different global climate warmings. I wonder how many glacier are committed to disappear in the European Alps under actual climate conditions (that is close to 1.0°C above pre-industrial values) ?
- **line 97**: do not forget that global average warming of 1.0°C does not result regionally of 1.0°C exactly of warming and thus glaciers can experienced large differences.
- **line 101 to 113**: is it feasible and physically consistent/interesting to go to daily resolution for runoff calculation ?
- **line 122**: I think authors could be more incisive about the irreversible glacier trend. Physically, glaciers growths and retreats are totally consistent and reversible, thus that's not surprising that if global temperature starts to stabilize and reduce after 2100 horizon, glaciers start to grow again at regional scale.
- **line 141**: I am surprised that what seems to me the key message, i.e. "every half-degree count", is not more highlighting in the paper (in the abstract for example).

- **figure 1**: to be consistent between panel a) and b), the vertical axis should be either in unit or in unit change (%) for both panels.
- **figure 1 and 2**: is it consistent to choose a moving average window of 30 years for climate averaging and 20 years for runoff averaging ?
- **figure 2:** why there is no peak water in the curves for annual glacier runoff (panel c) ? How does it compare to other studies ? Does it mean that the peak water is already reached for glaciers in the European Alps ?

- **supplementary material, table 1**: read again the legend which is I think not clear. Probably remove "given as Area ??" and please explicit "w.r.t".