Reply to Reviewer 4 :

We have complied with all the comments made by Reviewer 4 (see the point-by-point response below). The replies are in italics.

General comments :

This Brief communication is a revised version. I would like to comment that the track changes in yellow is not really a full track change. One does not see deleted words or edits, just parts where changes are made in marked in yellow. I recommend the authors use a real track change version along with a clean version to make it easier for the authors in new papers or revised versions of this paper. I find the paper suitable for publishing as a TC Brief communication with its form of three figures and short text. The topic is indeed relevant and timely. The authors have responded to the reviews and even published more material. Could the extra material be published as supplement to the paper? I am not sure if this is allowed in the BC format, but if not it is available through the open discussion. I recommend some modifications to address the tone in the manuscript as it is clear from the review round that some heat was caused by the tone. I agree with the editor 'that the article's reach will be much greater if it was to be framed as a thorough, yet neutral analysis, rather than an open criticism of previous work (in the original submission, some of the wording suggested the latter).' In my opinion the authors have mended it partly, but could still remove phrases like questioned in the abstract and surprisingly in the main text. You can get your point stated without this by reformulating to a gentler tone. Such experienced researchers should be able to do so. E.g. they write that they have removed the sentence on line 36 "Their paper questions the use of temperature-index models for projections of glacier-mass changes in response to global warming ." But they still have a similar sentence in their abstract, revised vs line 15 ' ..has recently been questioned' This sentence should be reformulated to be more neutral.

Many thanks for your comments. We agree. It is crucial that our paper does not sound as reproach. As mentioned earlier in the round of submission, our unique purpose is to show that temperature-index models are able to capture nonlinear responses of glacier mass balance (MB) to high deviations in air temperature and solid precipitation.
In the abstract, « has been questioned » has been removed and the sentence has been reformulated : « The ability of temperature-index models to capture nonlinear responses of glacier surface-mass balance (SMB) to high deviations in air temperature and solid precipitation has recently been discussed in the context of mass-balance simulations employing advanced machine-learning techniques."
We think it is difficult to be more neutral.
We also removed "and simple" in the abstract to keep the 100-word upper limit as required in the BC format.
"Surprisingly" has been removed (l. 130).

About extra material which could be published as supplement to the paper:

Our analysis led to find several anomalies in the paper of Bolibar et al. For instance, from our results, we found that the response of SMB to summer snow fall anomalies, using degree day model is almost linear. The annual mass balance anomaly cannot be detected because the summer snow falls are low and do not affect significantly the sensitivity. Although the summer snow fall can affect the summer mass balance, the response to summer mass balance anomaly is almost linear to summer snow fall changes. In addition, in the future, the summer snowfall will be presumably increasingly lower.
It is very surprising that Bolibar et al. (2022) encountered that the strongest nonlinear response (from a statistical point of view) came from summer snowfall anomalies. However, this new discrepancy with Bolibar et al. study is beyond the scope of our paper. Again, the topic of our paper is to demonstrate that the responses of degree-day model to temperature and winter accumulation are nonlinear.

In fact, it is not very pleasant and comfortable to write a paper which on some points goes against the conclusions of another paper. Given that temperature index models are widely used by the glaciological community for glacier projections in large scale-studies over the 21st century, and according discussions with several scientists involved in this research we contacted about this subject, we believed that it was crucial to clarify these issues. We hope it has been done with our paper.
However, we will be very happy when the process will be over.
Many thanks again to Reviewer and Editor to help us to make a paper more neutral.

In the following I address others parts where this can be done. I don't think this will be in the way for their message, rather make it clearer and more neutral. The current lines 34-41 could also be written more neutral, e.g. by removing on line 35, unlike linear statistical and temperature-index models.

Agree. « unlike linear statistical and temperature-index models » has been removed.

And instead of writing on line 37-39 Bolibar et al. (2022) argue that temperature-index models, widely used to simulate the large-scale evolution of glaciers, provide only linear relationships between positive degree-days (PDDs), solid precipitation and SMB. Change to Bolibar et al. (2022) argue that temperature-index models, widely used to simulate the large-scale evolution of glaciers, can be suitable for steep mountain glaciers, but may be less suitable for some scenarios and flatter glaciers and ice caps due to linear sensitivities in such mass balance models. In this way it is more neutral and then can have a natural transition to the point of your study.
Agree. The sentence has been replaced according to your suggestion

The authors emphasize the aims many times in the response but it could be more clearly written here. I thus recommend the use of 'only' here to be avoided. It is like using never and always, they are rarely true and easy to argue against. You write in the response 'Our unique purpose is to show that temperature-index models are able to capture nonlinear responses of glacier mass balance (MB) to high deviations in air temperature and solid precipitation.' Why not merge this with line on 39 starting Here we… you can make your point clearer. E.g. 'In this paper we perform numerical experiments with a classic and simple temperature-index model. Our unique purpose is to demonstrate that temperature-index models are able to capture nonlinear responses of glacier mass balance (MB) to high deviations in air temperature and solid precipitation.'

Many thanks. We have adopted your suggestion.

Line 107. …I suggest dropping the last part of the sentence 'contrary to the conclusions of Bolibar et al. (2022) relative to temperature index model.' Your point will still be valid without it.

Agree. The last part of the sentence « contrary to the conclusions of Bolibar et al. (2022) relative to temperature index model. » has been removed.

L122 . similarly drop ' and this is also inconsistent with the conclusions of Bolibar et al. (2022) relative to the sensitivity of temperature-index models' your point is still clear even if you drop this part of the sentence. As you write in your response "Our unique purpose is to show that temperature-index models are able to capture nonlinear responses of glacier mass balance (MB) to high deviations in air temperature and solid precipitation.' Focus on this aim.

Agree. The part of the sentence "and this is also inconsistent with the conclusions of Bolibar et al. (2022) relative to the sensitivity of temperature-index models" has been removed.

L135. Consider rewrite the sentence the opposite results …are paradoxical …I suggest at least to drop 'are paradoxical' you need not have this in the paper to demonstrate your point.

Agree. « are paradoxical » has been removed.

L141-L152. This whole section should be rewritten to make it more neutral. I emphasize it is fair to discuss the choice of or interpretation of models/other studies, but the tone can be adjusted. Words like ‘claim’, ‘even more surprising’ etc seems a bit unneeded. Try to make the points/text more neutral.

Agree. The sentences of this section have ben reformulated to make the points more neutral.

Line 150, rev vs. they state that ‘. Surprisingly, we detect sensitivity to winter accumulation, contrary to the Bolibar et al. (2022) findings using their ANN (Fig. 2 and 3). ‘ -> Please reformulate and avoid using phrases like Surprisingly to sound more neutral.

Agree. « Surprising » and « surprisingly » have been removed. The sentences have ben reformulated to make the points more neutral.

L156: Rewite this ‘These results question those of Bolibar et al. (2022), who argue that temperature-index models provide only linear relationships between positive degree-days (PDDs), solid precipitation and SMB.’ Why not rather write: These results highlight that temperature-index models are able to capture nonlinear responses of glacier mass balance (MB) to high deviations in air temperature and solid precipitation.’ To emphasize your purpose. Delete: ‘We tried to understand the cause of this discrepancy.’ Then you can continue with: Bolibar et al. (2022) compared the response of SMB to climate forcing (air temperature, winter and summer snow falls).

Agree. However, given that the first sentence of Conclusions is very similar to your suggestion, we merged the two sentences: « From numerical experiments with a classic and simple temperature-index model, our results highlight that temperature-index models are able to capture nonlinear responses of glacier mass balance (MB) to high deviations in air temperature and solid precipitation, unlike Bolibar et al. (2022) study. »