

Dear Editor,

We would like to thank the Reviewers for this second round of reviews and suggestions. We have addressed all the points highlighted by the reviewers and we modified the manuscript accordingly. In particular:

- Figure 7 was improved adding panel titles
- Figure 10a was corrected adding the wind speed data ≥ 25 m/s with partial shade
- Figure 12 was corrected adding panel letters a), b), c) etc.
- The former last figure, which was introduced in the Discussion session, is now reported as Figure 3, in the Study area.
- Table 2 was edited merging the bracketed information into the right column, which contains the full variable description
- the text was edited as suggested by the reviewers

In the following, we answer in detail to the specific comments made by the reviewers. The author responses are reported in blue colour right below the reviewers' comments. Line and page numbers indicated by the reviewers are referred to the submitted paper, whereas line numbers indicated in the authors' replies are referred to the revised paper (track change version).

Thank you to the authors for revising the manuscript and providing additional information. The work has substantially improved. However, a few aspects still require clarification, which I outline in the following main and specific comments.

Main comments

Figure quality

The overall figure quality needs improvement to meet the journal's high standards. Many figures are hard to read—often lacking headers—with panel arrangements that could be better organized and captions that make it difficult to extract the required information. Please optimize the use of figure space and ensure color choices are accessible to color-blind readers.

Reply: we have improved figures according to the suggestions by the reviewer, as detailed in the following replies. We used color-blindness palettes as much as possible, with a few exceptions where it was not feasible because the color was predefined by the used software, which is for the model's outputs figure that is generated by the SNOWPACK and for the correlation matrix.

Order of content

As already noted in the first round, the organization of content is not clearly separated, in my opinion. Material that belongs in the Data chapter is presented in the Methods section: the AWS site description (3.1) should be moved to Data as part of a clear description of site and data, and section 3.2 on mass-balance observations also belongs in the Data chapter. Additionally, elements of discussion appear in the Results section, and an extra results figure is introduced in the Discussion. Introducing a new figure in the Discussion requires strong justification, which is lacking in this study, I think.

Reply: we think that the description of the methods and instruments used for collecting meteorological and mass balance data fit better in the Methods section, and we prefer to avoid moving them in the 'Study area' description. For improved clarity, we modified subsection 3 headings using 'Collection of meteorological data, and 'Collection of mass balance data', which are now more effectively separated from the following subsections of the Methods. The figure formerly introduced in the Discussion (former Figure

13) was moved in the Study area, and is now Figure 3. All following figures have been consequently renumbered (also where they are mentioned along the text).

Lapse rate

As I understand it, you have switched to a single, constant precipitation lapse rate, applying a 28% increase per kilometer across the entire simulation. You attribute this value to Carturan et al. (2019), yet I could not find this specific figure in that study; moreover, their approach seems to use month-specific lapse rates. Please justify the choice of a single year-round value and explain the difference to the methodology of the cited study.

Reply: a fixed lapse rate can be justified instead of a month-specific precipitation lapse rate by the fact that the seasonality is expected to vary significantly across the region, in particular during summer when thunderstorms prevail, but also considering the orographic characteristics. As we have no information on how monthly lapse rate might change in the Ortles area (also considering the type and time resolution of snow water equivalent measurements, as already mentioned in the Methods, Section 3.2), compared to Val de La Mare, we consider it more prudent to use a fixed lapse rate. Explanation added in the text (line 240-244).

Warming/Cooling (e.g. Line 284-285)

You argue that humidity and radiation do not change and therefore simply increase temperature. However, this approach produces physically inconsistent time series at each model time step. Please point at this in your discussion. The rise in temperature due to climate warming is not merely an add-on of, for example, 2 °C. Be very careful with this line of reasoning and may better avoid it. It might be better to state clearly that this is a very simple sensitivity analysis, not a climate scenario analysis.

Reply: considering the reviewer's suggestion, we better clarified this concept in Section 3.5, making more clear what we mean with the term 'scenario' in order to avoid misinterpretation by the readers (line 277-284). We also further clarified this concept in the Discussion, where the approximations of the simplified approach are discussed (line 511-512).

Specific comments

Line 19: Point out that this point is in the accumulation area of the glacier.

Reply: ok, specified as requested (line 19)

Line 23: Add numbers of Line 635 to this part of the abstract (i.e. 91% of the snow, which is 21% of the total snow fall removed by erosion)

Reply: ok, percentages added as suggested (line 23-26)

Line 192: we -> were

Reply: ok, modified accordingly (line 202)

Tab. 2: The left column contains the variable name along with a brief description. Please merge the bracketed information into the right column, which contains the full variable description.

Reply: ok, modified as suggested

Fig. 4: The grain shape legend is not explained in the manuscript. Without explanation of the symbols it is not possible to understand the figure.

Reply: the grain shape symbolism derives from the conventional and widely used Fierz et al., (2009) International Classification for Seasonal Snow on the Ground. Added in the text of the Fig. 4 caption (now Figure 6). Reference added to the References Section (line 739)

Fig. 5: I suggest to first present evaluation results (move this figure to the beginning of the result chapter).

Reply: we switched the order of presentation of the text in Section 4.1 as suggested, included the two figures 5 and 6, whose numbers are now also switched

Line 322-325. Try to separate result and discussion. Discussion parts in the result chapter.

Reply: as there is not perfect line matching between those indicated by the Reviewer and any of the submitted versions of the revised paper (with or without track changes) we think that this comment is referred to the description of the correlation analysis (Section 4.2.1). In this case, we choose to add small sentences at the end of the presentation of each major result, in order to provide the reader a key for understanding the physical meaning of correlations. Without these short sentences, the presentation of results in this part would be a mere list of correlations, difficult to read or understand in their meaning.

Fig. 6: Please consider adding figure labels such as “(a) Dry snow hourly erosion events,” so the reader does not have to search the caption. It would be great to analyze the same descriptor across all four types of events. Is this possible? As it stands, it is very hard to see patterns in the results because the reader has to find the position of each descriptor in each panel—making it almost impossible to discern patterns and identify the descriptors.

Reply: in agreement with the reviewer’s suggestion, we added the figure labels to improve clarity (this is now Figure 7). It is not possible to use the same descriptors across all four types of events, because for example dry-snow events cannot have positive degree days sum or cumulative melt, by definition. Similarly, the left column cannot contain WS_Th and T_Th because these two variables can only be calculated when an erosion event starts, and this is the reason why in the right column there is smaller sample size compared to the left column.

Fig. 9: Please add to panel (a) a shaded region indicating the value range that was removed. In my view, stating this only in the caption is insufficient; it should be shown in the figure. Also, please consider to add panel headers. Without them, it takes too long to understand the figure because one has to switch back and forth between the caption and the figure.

Reply: we have added the value range with smaller sample size, and shaded it, as suggested in panel (a) (this is now figure 10). As per the panel headers, we think they would be too long and because there are only two panels, we consider the figure clear enough with the explanations reported in the caption (this explanation is required and cannot be summarized effectively in a short panel header).

Fig. 10: I suggest to make this figure separate for dry and wetted snow and remove Fig. 8.

Reply: (Now figure 11) We tried to separate dry and wetted snow events but the results are not so great because of the much different sample size of the two types of events. We attach the figure below just to show how it looks like.

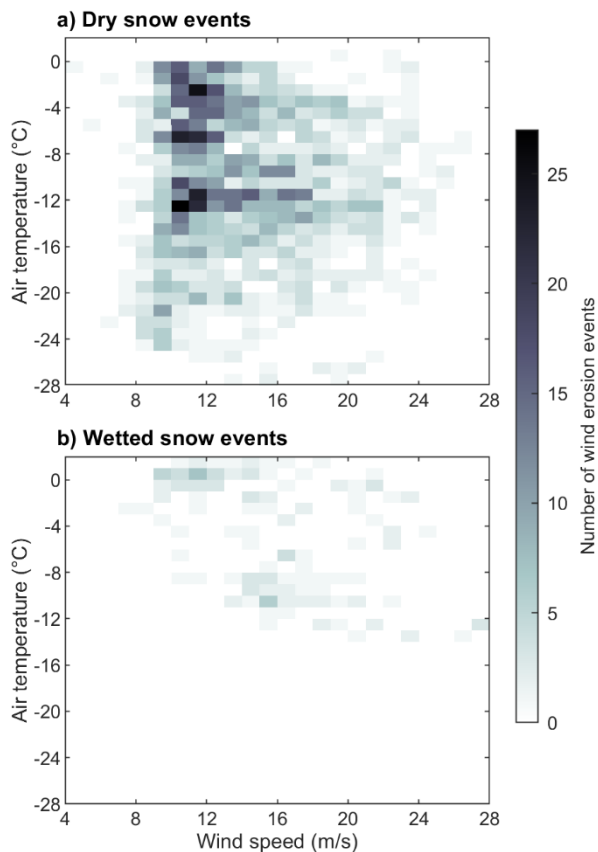


Fig. 11: Please consider to add panels (a-g) and consider to make boxes around each plot.

Reply: (Now figure 12) We added panels (a-g) as suggested, but we prefer the figure without boxes around each plot.

Fig. 12: I am not sure what is the added information from this figure compare to Fig. 10. If there is no new information, please consider to remove this figure.

Reply: (now figure 13) This figure compares different air temperature scenarios and provide indication on the seasonality of changes in the snow erosion, and on the seasonal sensitivity of these changes (not shown by figure 10, now figure 11). We think that it is worth keeping this figure

Line 485: I wouldn't use the word "physically" here, since you're applying a very simple, fixed lapse-rate approach that I wouldn't consider "physically based." This type of adjustment is reasonable and plausible, but not "physically consistent." In reality, the lapse rate is not constant; it varies widely and differs from event to event.

Reply: ok, we have removed the word 'physically', as suggested (line 476)

Fig. 13: It's unclear why a new results figure is shown in the Discussion. These are important results and should be moved to the Results section. Please avoid adding new results in the Discussion.

Reply: we have moved this figure in the study area (this is now figure 3) because it complements the information already provided by Figure 2.

Line 625-625: Your study addresses not just the quantification, but also differentiates wetted and dry snow over several winter seasons, complemented by a sensitivity analysis with respect to temperature. This is an important sentence that should to be extended and improved.

Reply: ok, information added, thanks for the suggestion (line 604-605).

Line 632. I think you need to be careful to describe the current climate as the same as it was 15 years ago. Changes are happening very rapidly, and 15 years later we may already be under different conditions, with warming rates of 0.5–0.6 °C per decade.

Reply: ok, modified as suggested (line 610).