Response to RC2

We are grateful for Dr. Jeffery Munroe's review and constructive comments to improve this manuscript. We respond to his comments below. Reviewer comments are displayed below in bold, author responses are in standard text.

<u>Specific comments:</u>

All of the figures are relevant and helpful to the reader, but I think a few of them should be changed. Specifically, Figures 5 and 7 are difficult to read because the colors used to represent the snow surface at the different times are too similar. Both of these figures are really important – they nicely present the data and allow clear visual distinctions to be made between scans, between slopes, and between the two winters. Improving their readability with more contrasting colors is a necessary step that will greatly help comprehension of the reader.

Thanks. We have struggled with the color schemes for this figure for a while. To address these concerns, we have attempted to render the diagrams with more contrasting colors than the greyscale we had originally selected. Although we acknowledge readability is still not perfect, we thought it was important to include all selected profiles in the seasonal profile progressions rather than eliminate some profiles in the interest of legibility.

I found Figures 9 and 12 difficult for a similar reason. While one might think that the bright red and dark blue colors representing the extremes of the change spectrum would be visible against the grayscale hilshade, the differences are actually really subtle. The figures are both important because they illustrate just how sensitive the TLS method is to even small changes in the snow surface. Unfortunately, the areas that changed are just really hard to see – even with the arrows drawing attention to specific regions in the images. I'm not sure what to recommend here. It is possible that a different color scheme would work better. Another possibility would be to keep a large figure representing the overview of the slope, and having a series of enlargements of small areas (keyed back to boxes in the overview figure) that showed the detected changes in a more obvious, zoomed-in way. Just as in my comment above, these figures are critical to presenting your data and supporting the following discussion – it would be great if they could be made even more compelling.

We agree the changes were too difficult to discern with the color scale as originally presented in the figure. The issue was attempting to display more subtle changes to the snow surface on the slopes below the cornices with a quantitative M3C2 distance scale suitable to represent the much greater changes to the cornices themselves (scale from -5 m to 5 m). To address this issue, we have changed the scale from -2 m to 2 m to better represent the changes to slope below the cornices. This hopefully helps differentiation between specific snow surface features, while also drawing attention to the dramatic changes on the cornices. We've added "greater than" or "less than" symbology to the scale labels to show that M3C2 distance changes on the cornices exceed the variability captured by this scale (also evident in the text and Figures 5 and 7).

Technical corrections:

Line 30 – "…projections of snow that form due to…"
Changed.

Line 40 – "…Cornice hazards."
Fixed.

Line 76 – Would "designing" be a better word than "planning" here?
Yes – we altered the sentence to hopefully improve clarity.

Line 90 – I usually capitalize "U-shaped valley."
We have changed the punctuation to reflect this.

Line 90 – "…oriented axis running…"
Changed, thank you.

Line 95 – Is there any information about the thickness of the continuous permafrost?
Yes, thank you for pointing out this omission. We've added the information from Humlum et al. (2003).

Line 101 – "consists of a 50-70 m, near-vertical bedrock cliff situated under the plateau margin and above…"
Thanks.

Line 115 – "The climate of Svalbard prohibits…"
Changed.

Line 139 – by "reliable" snow depth data do you mean the start of the seasonal snow accumulation? Or is this the date at which the snowpack exceeded a certain minimum thickness necessary for accurate measurement?
We meant the date at which the snowpack became deep enough to overcome to local ground surface roughness and become "smooth" enough to generate reliable measurements. Since this point is largely irrelevant for the larger purposes of this paper, we have removed the word "reliable" from the sentence to avoid confusion.

Line 154 – "…we used to georeferenced individual…"
Thanks.

Line 225 – I'm not sure what "(Size D2, R3)" means.
This refers to the destructive / relative size classifications used to characterize avalanche sizes. We've left this description in for now, but it can be easily removed if the editor finds it confusing or detrimental to the manuscript's clarity. We have also added a reference to the recording standards for avalanche sizes.

Line 370-372 – I would include reference to Figure 7 and Figure 5 here.
Good point, thanks. Figure references added.

Line 380 – "…to suggest that specific interactions…"
Changed.

Line 387 – "…cornices we investigated, and also failed completely both seasons."
Changed, thanks.

Line 439 – "…also favorable for the development of more…"
Thanks.

Line 629 – "…was taken is indicated by POV in …"
Fixed, thank you!