Dear editor, dear reviewer,

We sincerely thank you for your constructive comments to increase the readability of the paper. We have modified the manuscript accordingly. Please find below the documentation of changes made to the manuscript.

With kind regards,

Christian Halla on behalf of all authors

1 Documentation of changes to the manuscript according to the referee report (Referee #1)

Thank you very much for the feedback and for addressing the remaining grammatical and sentence structure issues. We have corrected all the requested minor technical changes. Details of these changes are listed below.

The following list contains the line numbers of the marked minor technical changes that have been corrected exactly as suggested in the tc-referee-report-1:

L24, L26, L47, L106, L108, L117, L141, L149, L167, L167, L182, L183, L190, L349, L369, L378, L399, L717, L738, L754,

Based on the comment on L775, we reworded the sentence:

Based on these data sets we found that water pathways and traps in depressions and furrows, and ice-rich permafrost below ridges indicate interactions of the distinct ridge and furrow topography with the internal hydrologic structure of the rock glacier.

Based on the comments on L784-787, we rephrased the sentences:

Interannual water storage changes corresponds to 11-42% of the potential discharge at the spring and 2-4% of the water content of 0.36(±32%)–0.43(±32%) × 10^9 kg of the rock glacier at the end of the thaw period. The majority of water input and seasonal meltwater may leave the internal hydrological system of the rock glacier along other groundwater pathways.

Based on the comments on L795-799, we rephrased the last paragraph:

Yet, further monitoring approaches and field-based studies on rock glacier hydrology are necessary to elucidate quantities and the functioning of long- and short-term storage changes, as well as their interactions with catchment hydrology. The water storage capacities and hydrological contributions of active rock glaciers and ice-rich permafrost may become more and more important as potential water reservoirs and sources in dry mountain catchment due to changes of the cryosphere.

2 Documentation of changes to the manuscript according to the editor's notes

The following list contains the line numbers of the requested minor technical changes in the manuscript (tc-2020-29-comments-to-author.pdf), corrected exactly as suggested by editor:

L56, L61, L389, L525, L751, L765, L766, L770, L771

Based on the comments on L40-42, the term periglacial and the following sentence were removed:

~~It is beyond the scope of this case study to discuss the multiple hypothesis regarding the genetic evolution of rock glaciers (Knight et al., 2019) and debate periglacial and glacial origins of rock glaciers (Berthling, 2011).~~

Based on the comment on L525, 'limit of detection' was spelled out in the discussion and the sentence of L533 was reworded:

Thus, our calculated interannual vertical changes based on values above the limit of detection are at least one magnitude greater than vertical changes expected from spatial variations of the flow regime.

Based on the comment on L589-590, the sentence was reworded:

In order to relate spatial heterogeneities of the internal hydrologic structures of the rock glacier to the observed vertical and horizontal surface velocities, the following discussion is focused on the individual geomorphologic units.

Based on the comment on L711-714, the sentences were reworded:

Interannual storage changes derived from volumetric changes of –36 mm yr^{-1} ($–8.92 \times 10^6$ kg) in 2016-17 and 28 mm yr^{-1} (6.64×10^6 kg) in 2017-18 correspond to only 2–4% of the water content (using the mean f_w as upper bound) at the end of the thaw period. The small ratio of interannual ice storage changes with respect to the 4PM-derived water content suggests that a) volumetric changes due to ground ice loss and gain can occur under very dry conditions, and b) the water content may be overestimated, given 4PM sensitivity and the wet ground conditions during the geophysical measurements

Based on the comments on L773-778, we reworded the paragraph:

Based on these data sets we found that water pathways and traps in depressions and furrows, and ice-rich permafrost below ridges indicate interactions of the distinct ridge and furrow topography with the internal hydrologic structure of the rock glacier. The role of drainage pathways and water traps along longitudinal and transverse furrows is also reflected by the net mass changes of ice in downward direction. Horizontal surface deformations up to 2 m yr-1 prove the active status of the rock glacier.

Based on the comments on L792-799, we reworded the paragraph:

Front and side slopes should be excluded from rock glacier areas to avoid overestimations of local and regional water storage capacities. This study closes an important knowledge gap with respect to the quantification of ice content and water storages changes of an active talus rock glacier in the dry Andes and can serve as a benchmark for further field based approaches.

Yet, further monitoring approaches and field-based studies on rock glacier hydrology are necessary to elucidate quantities and the functioning of long- and short-term storage changes, as well as their interactions with catchment hydrology. The water storage capacities and hydrological contributions of active rock glaciers and ice-rich permafrost may become more and more important as potential water reservoirs and sources in dry mountain catchment due to changes of the cryosphere.