Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2020-8-AC3, 2020

Earth Surface Dynamics Discussions
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EGU

Interactive comment on "Current glacier recession causes significant rockfall increase: The immediate paraglacial response of deglaciating cirque walls" *by* Ingo Hartmeyer et al.

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Received and published: 25 June 2020

Dear Alison Anders,

thank you for your constructive and insightful comments which we feel helped to improve the manuscript.

We (i) uploaded a revised version of the manuscript (one version with markups showing revisions and responses to minor comments, the other with a clean layout), (ii) posted a new author's comment to inform on general amendments in the manuscript, and (iii) below provide a point-by-point response to your comments. Our response is structured

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as follows: (1) referee comment and (2) author's response including direct references to manuscript changes.

(1) I would encourage the authors to use the observations to more carefully test some hypotheses on what controls the rate of cirque-headwall rockfalls. Specifically, please elaborate on the pattern of rockfall with orientation. The bedrock is described as having prominent cleavage to the NE and lots of jointing (without orientations provided). The majority of rockfalls are on NW or N facing slopes - which is attributed to specific locations? Perhaps the figure could be clarified to differentiate between rockfalls in different locations. Can this be clarified?

(2) We added information on discontinuities/jointing to the study site description (see Sect. 2 and new Fig. 4), and added a new subchapter in which we elaborate on the pattern of rockfall with orientation (see Sect. 4.4 Sectoral Rockfall Distribution). We furthermore added a paragraph on the sectoral rockfall distribution to the beginning of the discussion (Sect. 5)

(1) There are faults in the vicinity of the major rockfalls? Can those faults be shown on the images?

(2) Faults/Weakness zones are now displayed on Fig. 4, 7 and 8 which were added to the manuscript.

(1) Can joint/fracture spacing be quantified on the different faces? (Perhaps using the existing Lidar data?)

(2) The quantification of joint/fracture spacing would require higher data resolution. We added new figures (Fig. 4, 7 and 8) to visualise weakness zones in more detail and added a verbal description of zones with increased rockfall activity to Sect 4.2.

(1) Is there a difference in the thickness of the rockfalls with orientation (or a pattern related to location)?

(2) We expanded Sect. 4.6 (Rockfall Failure Depths) and added a classification of

rockfall failure depth by slope aspect (Table 3).

(1) I would expect that microclimates would impact the rate of development of the active layer and the ultimate thickness of the active layer - and I would also expect that the microclimates might be largely controlled by aspect. Could the diurnal/seasonal temperature variations be modeled for the rockwall faces? Are any instrumental temperature data available?

(2) We added new (instrumental) temperature data to the manuscript, which includes (i) a set of unprecedented rock temperature data from the Randkluft, and (ii) datasets from 'cold' N-facing sections and 'warm' ESE-facing sections to compare the spectrum of seasonal variations. Data acquisition and measurement sites are described in Sect. 3.2, results are described in Sect. 4.7, and discussed in Sect. 5.1 and 5.2.

(1) Basically, I think that this data set could be probed in more detail to discern the influence of structure (jointing, foliation, faults) vs. climate in the rates and size of rockfalls. Doing so has the potential to increase the impact and significance of the paper.

(2) By adding the above mentioned information on bedrock temperature and structural weaknesses we hope to give a more rounded picture that allows better differentiation between the influence of structure vs. climate.

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