Earth Surf. Dynam. Discuss.,
https://doi.org/10.5194/esurf-2020-9-RC1, 2020

Earth Surface Dynamics Discussions Open Access EGU

Interactive comment on "Enhanced rockwall retreat and modified rockfall magnitudes/frequencies in deglaciating cirques from a 6-year LiDAR monitoring" *by* Ingo Hartmeyer et al.

Georgina Bennett (Referee)

g.l.bennett@exeter.ac.uk

Received and published: 26 March 2020

This study presents an inventory of rockfall events on cirque walls in an alpine landscape in Austria collected using repeat laser scanning. The authors find higher rates on the back wall due to fracture orientation and find that these are some of the highest rates of cirque retreat reported anywhere globally. They produce the first magnitude frequency distributions for cirque rockfall and find some interesting differences with distance from the glacier surface. Most significantly, rockfalls closer to the glacier surface, i.e. more recently deglaciated, tend to be larger, resulting in a

Printer-friendly version

Discussion paper

lower power law exponent in the magnitude frequency relationship. This study shows how rockfall hazard evolves following deglaciation forming valuable input to sediment cascade models and for hazard assessment in these landscapes. I really enjoyed reading this paper, which presents a very interesting dataset in a clear and generally well-presented way, and does a good job of highlighting the novelty of the research. It also does a very good job of covering the main literature on the topic, though I am better placed to say this from the perspective of magnitude frequency distributions of landslides/rockfall, rather than of cirque geomorphology, which I have less knowledge of. As a researcher interested in alpine sediment cascades, I would say that the main contribution of the paper is the quantification of how magnitude frequency distributions of rockfall evolve following deglaciation. However, I would suggest that the paper would be of appeal to geomorphologists interested in the role of geological structure on rockfall characteristics as well as those interested in glacial geomorphology. I think it is well placed in this journal following some minor revisions. I have made some more comments on the PDF attached but some points I noted down during the review are: Sometimes it is difficult to distinguish results presented in the two different papers. Perhaps make it clear briefly in the introduction the key findings and differences between these. You emphasize differences in the rates of cirque retreat in this paper but need to visualize how your rates compare to others and why they might differ. You mention that it is hard to compare rates over different spatial and temporal scales. Perhaps you could produce a figure or table comparing rates collected over similar spatial and temporal scales and perhaps a bit more discussion on why these might differ and why yours are so high. You seem to find a more elongated cirque geometry than the normal due to the effect of cataclinal back walls on erosion rates. Again, it would be interesting to see a plot visualizing the shape of this cirque in comparison to others, perhaps as a function of geological structure wherever this information is available? There is some information on uncertainties in the power law distributions e.g. resulting from inclusion or not of the largest rockfalls, that should be presented in the results section and relevant figure. You also lack quantification of error in your rockfall volumes i.e. the propagation of alignment errors between 1-2 cm. These should ideally be propagated into volume error following the method used in Bennett et al. 2012. All the best with your revisions, Georgie Bennett

Please also note the supplement to this comment:
https://www.earth-surf-dynam-discuss.net/esurf-2020-9/esurf-2020-9-RC1-supplement.pdf

Interactive comment on Earth Surf. Dynam. Discuss., https://doi.org/10.5194/esurf-2020-9, 2020.