



The imprint of glacial and periglacial erosion processes on fluvial landscape metrics

Moritz Liebl¹, Jörg Robl¹, David Lundbek Egholm², Kurt Stüwe³, and Gerit Gradwohl³

¹Department of Geography and Geology, University of Salzburg, Salzburg, Austria (moritz.liebl@sbg.ac.at)

²Department of Geoscience, Aarhus University, Aarhus, Denmark (david@geo.au.dk)

³Earth Science, University of Graz, Graz, Austria (kurt.stuewe@uni-graz.at)

The emerging Pleistocene glaciations have left a distinct topographic footprint in mountain ranges worldwide. However, it is still unclear how the formation of cirques above (including the potential destruction of peak relief) and the excavation of glacial troughs below the long-term snowline altered to the large-scale topographic pattern of mountain ranges originally conditioned by fluvial processes.

Some mountain ranges such as the Eastern Alps feature a bimodal topographic pattern characterized by a transition from increasing to decreasing slope with elevation. Bimodality might be an expression of glacial reshaping, as glacial troughs with steepened valley flanks have been formed at low elevations and low relief surfaces at high elevations. On the other hand, bimodality might represent the state of fluvial prematurity as expression of ongoing landscape adjustment to an uplift event in the recent past. Despite their completely different evolution, both hypotheses lead to a bimodal landscape with a similar slope-elevation distribution.

In this study, we explore the impact of cold climate erosional processes on the mountain range scale topographic pattern. For this, we use synthetically generated and natural mountain range landscapes conditioned by fluvial processes and apply a surface process model for cold climate conditions (iSOSIA). In regions with high glacial impact, we explore an upstream migrating glacial signature represented by two frequency maxima in the slope elevation distribution at lower elevations (i.e. below the snowline, where glacial troughs formed). This is accompanied with an increase in slope on average compared to the initial topography. Above the snow line, bimodality vanishes and mean slope is similar to the initial fluvial topography. Interestingly, in the Eastern Alps, we explore a similar pattern where the transition from increasing to decreasing slope with elevation is located at about 1800 m, which is roughly at the position of the last glacial maximum (LGM) snowline of this region.

How to cite: Liebl, M., Robl, J., Egholm, D. L., Stüwe, K., and Gradwohl, G.: The imprint of glacial and periglacial erosion processes on fluvial landscape metrics, EGU General Assembly 2020, Online, 4–8 May 2020, EGU2020-7587, <https://doi.org/10.5194/egusphere-egu2020-7587>, 2020

