



Quantification of biogeomorphic interactions between small-scale sediment transport and primary vegetation succession on proglacial slopes of the Gepatschferner, Austria

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Proglacial slopes provide suitable conditions to observe the co-development of abiotic and biotic systems. The frequency and magnitude of geomorphic processes and composition of plants govern this interplay, which is described in the biogeomorphic feedback window for glacier forelands. The study sets out to quantify small-scale sediment transport via mechanical erosion plots along a plant cover gradient and to investigate the multidirectional interactions between abiotic and biotic processes. We aim to generate quantitative data to test the biogeomorphic feedback window.

Small-scale biogeomorphic interactions were investigated on 30 test plots of 2 x 3 m size on proglacial slopes of the Gepatschferner (Kaunertal) in the Austrian Alps during snow-free summer months over three consecutive years. The experimental plots were established on slopes along a plant cover gradient. A detailed vegetation survey was carried out to capture biotic conditions and specific sediment yield was measured at each plot. Species abundance and composition at each site, as well as plant functional types reflected successional stages.

We observed a strong decline in geomorphic activity on plots with above 30% plant cover. Mean monthly rates of specific sediment yield decreased from 111 g m⁻² to 37 g m⁻². Non-metric multidimensional scaling showed distinct vegetation composition for the three stages of biogeomorphic succession. Quantified process rates and observed vegetation composition support the concept of biogeomorphic feedback windows. The findings help to narrow down a stage during succession where the importance of biotic processes start to dominate.