



Stabilizing slopes in the alpine proglacial zone with microorganisms-assisted plant covers

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Throughout Europe an increase of the economic damage from hydro-meteorological events, such as floods, droughts, storm surges, and landslides can be observed. Engineered solutions for risk prevention often generate high investment costs and in turn provide only a limited flexibility in coping with changed frequencies, intensities and localities of extreme events. In this regard nature based solutions (NBS) fostered at the root of the process chain are imagined to be a less invasive method, more flexible to changes, less expensive and thus considered a multi-beneficial alternative to traditional engineering methods. Vegetation cover plays an important role in stabilizing the slopes and in regard to sediment connectivity of land units. A commercial application of induced vegetation cover (greening services) is frequently applied for erosion prevention on alpine ski slopes in tourist areas.

Within the PHUSICOS project we aim at exploring slope protection in proglacial areas based on altitude adapted, naturally occurring plant species. The approach founds on the selection and promotion of erosion controlling functionalities of the plants supported by identified bacterial strains. The exploitation of beneficial plant-bacteria interactions has so far been restricted to crop plant species, thus its implementation as NBS in Alpine regions is pending and its acceptance by stakeholders needs to be assessed. We apply and verify our approach in a proglacial area of the Gepatschferner glacier, Kaunertal, Austria, which represents a dynamic geomorphological environment with high erosion rates and rapid responses to changes in surface cover.

The Kaunertal Valley, as a representative catchment for the cristalline Alps in Central Europe, faces an ongoing and fast retreat of the Gepatschferner glacier (>120 m a⁻¹) due to global warming. This exposes currently more than 6 km² of terrain with unconsolidated sediments on steep lateral moraines. Sediments mobilised during extreme precipitation and flooding events or by constant fluvial discharge have negative effects on important infrastructure such as roads, settlements and the Gepatsch reservoir used for hydropower generation.

The current situation of the sediment dynamics in the valley and planned activities in the context of a critical physical geography approach will be reviewed. The status quo will be outlined and based on the outcomes, the crucial aspects and challenges will be presented.