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Investigating an Alpine proglacial sediment budget using field measurements, airborne and terrestrial LiDAR data

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Abstract The ongoing recession of Alpine glaciers since the end of the Little Ice Age (LIA) has exposed stores of glacial sediment to the activity of paraglacial processes. Slope wash, fluvial processes and mass movements (including debris flows, slides and falls) within the proglacial area (i.e. the area within the LIA terminal moraines) have received comparatively little attention in previous studies of the (pro)glacial sediment budget that have focused mainly on suspended and bedload sediment transport in proglacial streams. Additionally, there is a need for research concerning the relative importance of non-glacial and glacial contributions to the sediment budget and the downstream consequences of increased proglacial geomorphic activity. The PROSA joint project (High-resolution measurements of morphodynamics in rapidly changing **PRO**glacial **S**ystems of the **A**lps) is designed to tackle these problems through a quantification of the aforementioned hillslope and channel processes within the forefield of the Gepatsch Glacier (Central Alps, Austria) using high-resolution LiDAR data. On the local scale, field measurements and digital elevation models from multi-epoch terrestrial LiDAR data will be combined to map and quantify sediment (re-)mobilisation, erosion and deposition. The catchment-scale sediment budget will be established by multi-epoch high-resolution airborne LiDAR data, upscaling of local findings using geomorphological models including the appraisal of slope–channel coupling, and an assessment of fluvial sediment export beyond the outlet of the catchment (which consists of a reservoir). This paper summarises the processes effective in proglacial systems, works out research needs with respect to sediment budgets in changing proglacial areas, and outlines the research framework of the PROSA joint project. It complements two papers on preliminary results published in this volume.

Key words proglacial sediment budget; airborne LiDAR; terrestrial LiDAR; Central Alps; Tyrol