



Paraglacial adjustment of Little Ice Age moraine slopes at the Gepatschferner glacier, Ötztal Alps, Austria

Ludwig Hilger, Tobias Heckmann, Florian Haas, Jana-Marie Dusik, Fabian Neugirg, and Michael Becht
Physical Geography, Cath. University of Eichstaett-Ingolstadt, Eichstaett, Germany (l.hilger@ku.de)

In days of rapid glacier retreat, the morphodynamics of freshly exposed terrain have attained quite some interest. The availability of sediment for various geomorphic processes has been increasing since the end of the “Little Ice Age” (LIA) and will continue to do so. This is the case especially for large lateral moraines as they are frequently high and steep, and loose consolidation after the melting of glacier and underground ice. The adjustment to non-glacial conditions by the reworking of the glacial sediments through slope wash, fluvial and gravitational processes can be analysed within the theoretical framework of paraglacial geomorphology.

Curry, Cleasby & Zukowskyj (2006) showed that lateral moraine morphology and process rates change over time since deglaciation and calibrated exhaustion curves of sediment availability to their study areas using a total station for data acquisition. Our approach was to use digital elevation models generated from high resolution airborne LiDAR data (> 10 pts/sqm) for a detailed morphometric analysis. Several test subsections of a chronosequence of deglaciation on the true-right LIA lateral moraine slope of the Gepatschferner glacier were defined and very high resolution DEMs of the subsections were generated from the LiDAR point cloud. Sediment budgets for each time interval and lateral moraine subsection were estimated from a reconstruction of the pre-incision moraine surface. Different glacial stages digitized from historical maps and multi-temporal orthophotos data were used to estimate the respective time passed since deglaciation. This space-for-time substitution approach makes it possible to estimate section specific erosion rates, to calibrate a sediment exhaustion curve for the Gepatschferner lateral moraine and to monitor the development of morphometric parameters (lateral slope angle, paraglacial gully index, profiles, etc.) of the gullies dissecting the lateral moraines over time / distance from the glacier snout.

The work presented here is part of the joint project PROSA (High-resolution measurements of morphodynamics in rapidly changing PROglacial Systems of the Alps) which deals with the generation of the sediment budget for an alpine catchment in the Austrian Alps.