Geophysical Research Abstracts
Vol. 16, EGU2014-16472, 2014
EGU General Assembly 2014

Pro- and paraglacial sediment fluxes in the Austrian Alps

Martin Geilhausen (1) and Lothar Schrott (2)

(1) Zurich University of Applied Sciences, Institute of Natural Resource Sciences, Wädenswil, Switzerland (martin.geilhausen@zhaw.ch), (2) University of Bonn, Department of Geography, Bonn, Germany (lothar.schrott@uni-bonn.de)

Proglacial zones are in transition from glacial to non-glacial conditions and thus out of equilibrium with the current climate and highly sensitive to climate change. The expansion and evolution of these zones are of importance to assess the implications of accelerated deglacierization and discharge modification on sediment transfer from mountain to foreland zones.

This study quantifies (sub)recent sediment transport and storage change within and the discharge of sediment from two proglacial zones in the Austrian Alps (Pasterze & Obersulzbachkees). Archival photogrammetry, airborne and terrestrial LiDAR is used to generate high-resolution digital elevation models (DEM) at different dates since the early 1950s. Erosion and deposition patterns are identified by DEMs of Difference (DoD) and are linked with terrain ages (i.e. time since deglaciation). Data on reservoir sedimentation and direct measurements of sediment concentrations/turbidity and discharge allows calculation of sediment yields.

Paraglacial slope adjustment operates through slope instability (glacial debuttressing), moraine degradation and gully incision, decreases in both areal extent and intensity with increasing distance from the glacier and becomes increasingly restricted to tributary channels. In ice marginal locations, geomorphic activity is more persistent as compared to the proglacial terrain. These findings are consistent with the typical rapid surface response observed elsewhere. However, the topography of the recently deglaciated terrain strongly affects the degree of subsystem (de)coupling, which in turn controls the contribution of paraglacial adjustment to the overall discharge of sediment. Proglacial lakes have formed in both study sites and contemporary paraglacial adjustment upstream of the lakes is insignificant for sediment yield. Downstream, slopes are currently decoupled from the glacifluvial transport system and till and debris are currently stored in both landsystems. Average specific suspended sediment yields from the Obersulzbachkees and Pasterze proglacial zone are ca. 455 ± 5 t/km^2/yr and ca. 1600 ± 100 t/km^2/yr respectively.

The degree of process and subsystem (de)coupling (i.e. connectivity) in the proglacial zone and the topography of the recently deglaciated valley floor affect both the quantity of hillslope sediment supply and the transport capacity of the meltwater stream and thus, are key controls on sediment delivery and sediment yield. The formation and subsequent aggradation of proglacial lakes significantly masks sediment yield. Thus, scenarios of future sediment flux from any proglacial zone would depend critically on the potential development of a proglacial lake.