

Decadal sediment yield from an Alpine proglacial zone inferred from reservoir sedimentation (Pasterze, Hohe Tauern, Austria)

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Abstract Reservoir sedimentation over more than five decades enabled the quantification of subrecent sediment yield from the glacierized Pasterze catchment, a 40-km² basin located in the Hohe Tauern Mountain range in Austria. Sediment yield is highly variable over an order of magnitude (1.5 to 16.7×10^4 t/year) with an average of $\sim 6.3 \pm 0.5 \times 10^4$ t/year resulting in a total sediment export of approx. 340×10^4 t of mainly fine grained sediment (D₅₀ Ø coarse silt). This is equal to specific sediment yields (SSY) ranging from 0.4 to 4.2×10^3 t/km²/year (Ø $1.6 \pm 0.1 \times 10^3$ t/km²/year) at a total of 85.6×10^3 t/km² in the 54 years studied. No significant correlation is found between annual data sets of sediment yield, discharge, glacial retreat and hydro-climate. Based on multi-temporal geomorphological mapping, a sandur (former proglacial lake) and a braid plain are identified as key landforms within the proglacial zone modulating sediment yield. It is assumed that sediment yield from proglacial zones will increase due to climate change which accelerates glacier melt. This study shows the impact of proglacial lakes on sediment yield which can reduce the connectivity between glacial sediment production and downstream sediment fluxes. The number of proglacial lakes within the Alps is expected to rise following accelerated glacial retreat. Three basins are located under the present tongue of Pasterze Glacier and further lakes will develop. It is assumed that sediment delivery from the Pasterze catchment will most likely be significantly altered in the near future. This will lead to changes in sediment yields with impacts on hydrology, river ecology and reservoir management.

Key words sediment yield; proglacial lake; glacier forefield; reservoir sedimentation; Pasterze Glacier