Sediment discharge from alpine glaciers in times of increased melt – an example from the Austrian Alps

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Glaciated mountains are zones of high sediment dynamics and at the same time very sensitive to climate change. In times of increased summer temperatures and high melt rates have been related to observed increase in sediment dynamics at various locations. However, this response seems to be highly variable also on regional scales indicating that controlling factors have yet not been fully identified and understood. Sediment output from glaciated catchments affects sediment budgets, streamflow ecology and hydropower generation. Data on sediment discharge from proglacial areas in the Alps is scarce. Knowledge on sediment responses to increasing temperatures and changing climates is crucial for river and reservoir management and climate change adaptation.

We contribute to this debate by quantifying sediment discharge from the Obersulzbachkees glacier, Hohe Tauern, Austria based on recent lake deposition volume. Located at the valley head of the Obersulzbach valley, the glacier experienced rapid degradation within the last 20 years and also showed high rates of sediment discharge. The formerly large single glacier disintegrated into five remaining parts and a large proglacial lake formed. Sediment discharge from these smaller glaciers is captured by the lakes and a huge delta has developed after retreat of ice from the lake. We quantified the lake and delta sediments using ground penetrating radar and sub-bottom profiling and revised our previous estimations by including new data increasing the accuracy of our finding. The Obersulzbachkees retreated by 400-800 m in distance between 1999 and 2019 and lost more than 3 km\textsuperscript{2} of glacier area. Between 2007 and 2019 more than 600,000 m\textsuperscript{3} of sediments have been deposited within the lake delta only. We discuss sediment discharge from glacier to lake in relation to glacier retreat and climate conditions since lake formation and relate our findings to both changes in the catchment and runoff and sediment output dynamics from the lake.