

## **A sediment budget from a glaciated catchment: reconciling subglacial and periglacial erosion on short timescales**

Ian Delaney (1), Saskia Gindraux (2), Yvo Weidmann (1), and Andreas Bauder (1)

(1) VAW, ETH-Zürich, Zürich, Switzerland (delaney@vaw.baug.ethz.ch), (2) WSL, Birmensdorf, Switzerland

Glaciated catchments are known to expel great amounts of sediment, particularly during periods of climatic perturbation. Sediment in these catchments either originates subglacially, where it is eroded by pressurized water below the glacier, or from periglacial areas, which are commonly comprised of easily erodible, unconsolidated material no longer buttressed and held in place by ice. To better forecast sediment dynamics and erosion rates in the future, contributions of subglacial and periglacial sediment must be quantified, and the processes controlling erosion in these respective sources described.

To determine the relative contributions of these sources, we examine the Griesgletscher catchment in the Swiss Alps. Its rather simplistic geometry, as well as, the presence of a proglacial reservoir that serves as a sediment trap, provides an unusually constrained environment to directly measure sediment sources and sinks in the catchment. Subtraction of three digital elevation models created from structure-from-motion and photogrammetric techniques over a one year period, from October 2015 to October 2016, were used to measure sediment flux from the proglacial area. Furthermore, comparison of bathymetries collected from the proglacial reservoir in fall of 2015 and 2016 determined total sediment flux from the entire catchment over this 10 km<sup>2</sup> time period. Data from a turbidity meter, installed below the reservoir outflow, suggest that negligible amounts of sediment leave the reservoir. Thus comparison of reservoir bathymetry and sediment fluxes from the proglacial area give estimates of the relative contribution of proglacial and subglacial sediment erosion to total catchment sedimentation. Analysis of this data suggest that while the proglacial area experiences a greater erosion rate, it is likely more sediment originates subglacially. As proglacial areas are expected to grow in area and partially stabilize, and glacial areas are predicted to shrink and possibly lose erosive capacity, these competing processes must be reconciled.