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First insights in bedload impact forces causing bedrock abrasion

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Incision of channels and its coupling to hillslope processes opposes tectonic uplift in building mountain topography. A major driver of the morphological evolution of steep mountain streams is erosion of genuine bedrock by impacting bedload particles. Currently, two families of models for fluvial bedrock erosion can be found in the literature. The shear-stress / stream-power family of models is based on the assumption that bedrock incision rate is a function of bed shear stress or stream power, and thus that channel hydraulics are the main driver of erosion. On the contrary, sediment-flux-dependent models are based on the assumption that fluvial incision is driven by the impact of moving bedload particles.

Here we present data on bedrock erosion together with in situ measurements of tangential and orthogonal forces acting on the bedrock bed of a mountain creek during several flood events. The signals sum up from the weigth of the water column and impact hits of bedload particles. In a separate device located directly downstream of the erosion measurements, data on bedload transport rates and the energy transferred to the bed can be obtained.

These data series in connection with surveying of bedrock erosion (abstract EGU2013-7513) will contribute to evaluate the saltation-abrasion model and other shear-stress based erosion models and shall enhance the understanding of physical bedrock abrasion processes as a basic contribution to landscape evolution modelling.