



Rock slope response to fluvial incision in the central Swiss Alps

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The longitudinal profile of rivers intersecting the Rhone Valley in the central Swiss Alps suggests the development of topography throughout much of this region has been dominated by interglacial fluvial incision and ongoing tectonic uplift with only minimal glacial erosion since the mid-Pleistocene transition. Evidence indicates bedrock river incision during this period reflects a base level fall of between 500 m and 800 m (depending on the degree of overdeepening following an early period of enhanced glacial incision). This observation raises important questions regarding the preservation, or development of hillslope morphologies through multiple glacial-interglacial cycles. Since the pioneering works of Richter (1900) and Penck and Brückner (1909), Alpine geomorphologists have commented on a sequence of between three and five moderately dipping matched terraces that converge toward inferred paleo-river channels up to 800 m above the axis of many valleys. Here, we use a combination of integral analysis, forward streampower models, and a new method of topographic analysis based on high resolution LiDAR DEMs in order to test the correspondence of valley morphologies in this formerly glaciated landscape, with hillslope processes initiated by fluvial incision up to 700,000 years ago. Results indicate topography adjacent to reaches subjected to transient fluvial incision is characterized by a coherent region of consistently steep slopes, while narrow gorges correspond to rapid incision close to the Rhone valley since MIS 5. A majority of hillslopes converge to our initial fluvial valley floor, or the location of propagating knickpoints. The correspondence between intermediate-level terraces and modeled stages of river incision is, however, currently unclear. These results offer a unique insight into the long-term response of bedrock slopes to varying rates of base level fall, and the cumulative impact of glacial erosion on Alpine valley walls since MIS 11.

Penck, A., and Brückner, E., 1909, *Die Alpen im Eiszeitalter*, Leipzig, Tauchnitz.

Richter, E., 1900, *Geomorphologische Untersuchungen in den Hochalpen*, Gotha, Perthes, v. 103.