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# Accounting for landslide-channel interactions in landscape evolution and hazards

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Landslides are prevalent in mountain landscapes and interact with the river network in a myriad of ways with impacts on flood and debris flow hazards and landscape evolution. Floods in mountainous regions often coincide with a high density of landslides triggered by heavy rainfall. However, the impacts of landslide-delivered sediment on flood dynamics are not typically considered in flood hazard assessment. Higher up in the river network, landslide sediment supply is a key component of debris flows. Yet, assessments of climate change impacts on debris flows to date have focused on likely changes in rainfall triggering potential of debris flows, overlooking the role of landslide sediment supply.

In a first case study, I demonstrate with an example from the Colorado Front Range how landslide-channel feedbacks can significantly amplify channel erosion and flood risk. We used a combination of field analysis and modelling with a multiphase flow model R.avaflow to test the hypotheses that landslide-flood interactions amplified channel erosion during a major flood event in 2013 by (1) bulking of the flow and (2) dam formation and failure dynamics.

In a second case study, I demonstrate with an example from the Swiss Alps, how landslide sediment supply limits debris flow hazard in a warming climate. We forced the sediment cascade model, SedCas, with climate simulations to disentangle the interactions between hydrological triggering, landslide sediment supply and elevation on mountain basin sediment transfer and debris flow hazard over the 21$^{st}$ century.