



Sediment budget in a Himalayan Valley (Middle Kali Gandaki, Nepal)

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Active mountains supply the largest sediment fluxes experienced on earth. At mountain range scale, sediment budgets are controlled by rock uplift and climate, hence by a wide range of erosion processes (detachment, transport and deposition), all operating within drainage basin units, with time and spatial patterns that indeed are quite complex at local scale. In the Himalayas, the sediment cascade is particularly efficient, as favoured by high, glaciated peaks, together with narrow valleys and steep hillslopes, in a monsoon-contrasted, climatic context. We focus on the Kali Gandaki valley, along the gorge section across Higher Himalaya (e.g. from Jomosom down to Tatopani). Along this reach, we identify sediment sources, sediment stores and sinks, and specifically consider hillslope interactions with valley floor at short and longer time scales, and their impact on sediment budgets and fluxes. We present a detailed sediment budget, constrained by available dates and/or relative chronology. Studied sites include rock-avalanches (Jomosom, Dhumpu), Pairothapla-Talbagar and Tatopani landslides, Ghatte khola debris fan, and terraces systems preserved at confluence sites along the lower slopes of the valley. On the basis of geomorphic surveys and mapping, and thanks to DEM facilities, we estimate the volume of each sedimentary unit, including lacustrine sediments trapped upstream of landslide and/or glacial dams. Debris volume eroded and/or deposited during the last decades is also calculated. Alternation of alluviation events and incision stages are then reconstructed, and their relation with sismo-tectonic and/or climatic triggering events suggested, according to the time scale considered. From our results it appears that if large landslides contribute significantly to the denudation history of active mountain range, more frequent, medium to small scales landslides are in fact of primary concern for Himalayan population. This conclusion suggests that in this very dynamic environment, a sediment budget and fluxes approach is a useful tool for assessing and managing potential threats to human settlements and infrastructures that are increasingly developing along these Himalayan valley corridors.