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# Middle Pleistocene infill of Tibetan Plateau margin rivers, Zanskar, India

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The Indus, one of Asia's premier rivers, drains the NW Himalaya and the Transhimalayan ranges that fringe the western Tibetan Plateau margin. There, upstream of the western Himalayan syntaxis, river valleys alternate between deeply incised bedrock gorges and broad alluviated reaches, while average denudation rates decrease by an order of magnitude towards the Tibetan Plateau margin to rates of ∼10 mm ka-1. Vast fill terrace staircases, the highest of them located up to 400 m above current river level, and intercalated lake sediments indicate alternating phases of incision and aggradation within the region, underlining the high landform preservation potential in the rain shadow of the High Himalaya. However, despite a broad interest in a better understanding of mechanisms that modulate plateau erosion, age constraints on the generation of these impressive features are sparse, though indicate mainly Pleistocene formation ages.

We present new age constraints from the More Plains section in the headwaters of the Zanskar River, a major tributary to the upper Indus. The vast sedimentary successions of the More Plains originally belonged to a former endorheic basin that has been tapped by the Zanskar River, today revealing exposures of >250 m of sedimentary fill that continues to smother a previously dissected alpine headwater landscape.

We combine 10Be surface exposure dating and catchment-averaged denudation rates, morphometric analysis and field observation to constrain the late Quaternary history of this section. Analysis of a 10Be depth profile on top of the More Plains, together with the dating of nearby amalgamated surface samples, indicate a surface exposure of ∼170 +/- 20 ka such that deposition of this valley fill ceased during a Middle Pleistocene cold stage (MIS 6). Using GIS-based algorithms we estimate that ∼3.6 km3 was removed from this section by fluvial erosion, requiring a specific sediment yield of >130 t km-2 yr-1 averaged over the past 170 ka. This outweighs the 10Be-constrained flux of sediment from adjacent catchments by a factor of 2-4, suggesting that dissection of large Pleistocene valley fills may be a significant source of sediment in Transhimalayan rivers, potentially offsetting estimates of bedrock denudation in the region.