



Prolonged and massive river damming by Siachen Glacier, Karakoram, during the penultimate glacial period

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Natural river-blocking dams have been suggested to affect the topographic evolution of continental plateaus by retarding headward fluvial incision. In the upper Shyok valley, on the western edge of the Tibetan Plateau, km-wide and flat valleys along with several hundred-meters high terraces testify voluminous sedimentary fillings resulting from massive and prolonged damming of one of the largest tributaries to the Indus River. We provide field mapping results showing that the Siachen Glacier was >190 km long and repeatedly blocked the Shyok River, causing massive upstream aggradation of which the river has not yet recovered. Cosmogenic nuclide exposure dating of the top surface of the valley fill constrains the end of the damming-episode and the onset of incision at ~130 ka, following approximately 40 kyr of aggradation. Similar events probably occurred several times during the Quaternary. However, despite prolonged river blocking, no knickzone developed in the long profile of the Shyok River at the dam-site. In contrast, a pronounced valley overdeepening is evidence for glacial erosion outpacing fluvial incision in this area. Our data document the potential longevity of massive glacier dams that can block large rivers in tectonically active orogens, possibly due to the constant replenishment with moving-up ice that counteracts dam incision after overtopping. However, because glaciers erode bedrock themselves, their ability to delay headward fluvial incision appears limited and may have been overrated in previous studies.