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Geomorphic evidence for Quaternary tectonics on the southern flank of the Yellowstone hotspots from terraces and stream profiles along the Hoback and Snake River

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The greater Yellowstone region offers a type example of Earth surface response to a mantle anomaly. Motion of the North American plate across the Yellowstone plume over the past 17 Ma is predicted to have produced a wave of transient uplift and extension of the upper crust. In the wake of the plume, the Snake River Plain (SRP) has been subsiding 4-8 km due to a combination of crustal loading by basaltic magmatism and cooling. Studying patterns and rates of Quaternary incision of rivers flowing off the Yellowstone plateau can test models about the distribution and timing of active uplift, subsidence, and faulting, improving our understanding of the geodynamics and the hazards in the region.

We present results from surveying and optically stimulated luminescence (OSL) dating of river terraces along the Hoback and upper Snake rivers (western Wyoming and southeastern Idaho), which provide a study transect from the modern Yellowstone hotspot center, across zones of changing fault activity, into the subsiding SRP. Downstream of Palisades Reservoir, dated fill terraces reveal that the Snake River has seen no apparent net incision since 50-60 ky. Moreover, a paleo-channel bed preserved by a $\sim$2 My-old basalt flow and exposed <10 m above the modern river suggests that net incision rates averaged over 2 My were <5 m/My. In contrast, upstream of Alpine, we find that three levels of 10-90 ky-old strath terraces record recent incision at rates of 0.1-0.3 mm/y along the deeply incised Alpine Canyon and the Hoback River. Here, the pattern of incision rates appear to be controlled by local baselevel fall along normal faults and we hypothesize that rates of subsidence of the SRP in the Quaternary have been relatively slow (< 0.1 mm/y).