Late Quaternary landscape evolution, climate, and neotectonism along the eastern margin of the Puna Plateau: Pucará Valley, NW Argentina

Details

Meeting	2013 Fall Meeting
Section	Earth and Planetary Surface Processes
Session	Exploring the Interplay Between Solid Earth Tectonics and Surface Processes From Mountains to the Sea II
Identifier	EP43E-01
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Index Terms	Quaternary geochronology [1105] Cosmogenic-nuclide exposure dating [1150] Tectonics and landscape evolution [8175]

Abstract

The eastern margin of the Puna Plateau has been the focus of many studies seeking to link climatically-moderated surface processes and tectonism through dynamic feedbacks. However, evaluating any theories regarding climatic-tectonic feedbacks requires the determination of tectonic, climatic, and geomorphic chronologies across a wide region, from plateau to wedge-top to foreland. In this study, we contribute to that effort by examining Quaternary landscape evolution of a single intermontane basin of spatially uniform climate, adjacent to the plateau margin. The semi-arid Pucará Valley contains eight abandoned and incised geomorphic surfaces, most of which are deformed by active structures. These geomorphic surfaces - thin alluvial fans and strath terraces - dominate the landscape and record multiple pulses of incision in the late Quaternary. We find no evidence for significant depositional intervals and valley incision continues currently. Substantial accumulations of pedogenic carbonate and pedogenic gypsum within abandoned surfaces indicate that arid or semi-arid conditions are long lived in this valley. Conversely, relict periglacial morphology in adjacent ranges supports cooler temperatures in the past. River incision is enhanced across active structures, but preliminary observations suggest that the magnitude of deformation cannot fully explain the magnitude of incision. As a result, we argue that extrabasinal base-level lowering is the primary driver of incision in the Pucará Valley, but Quaternary deformation is significant enough to spatially influence erosion. Cooler climatic intervals may influence the sedimentology of alluvial and fluvial deposits, but we find no evidence for significant climatic changes that could change rates or styles of landscape evolution over this time frame. Pending cosmogenic nuclide analysis of fan deposits and river sediments will permit the derivation of fault slip rates, surface ages, modern and paleo-

erosion rates, and sediment transport histories. These results will further refine our understanding of tectonic and climatic forcing of surface processes in the Quaternary.

Cite as: Author(s) (2013), Title, Abstract EP43E-01 presented at 2013 Fall Meeting, AGU, San Francisco, Calif., 9-13 Dec.
