



Aridity and erosional control of plateau evolution in the central Andes

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Observations from the central Andes indicate that continental plateaus may form in the hinterland of fold-and-thrust belts and high-angle revers fault bounded ranges involving deformation of basement rocks. First, in the Bolivian Andes, the Altiplano plateau is flanked by the Eastern Cordillera and the Subandean fold-and-thrust belt, while in northwestern Argentina to the south, the Puna plateau is bounded by ranges that involve basement deformation. Second, at the latitude of the Altiplano, deformation generally migrated eastward with time from the Eastern Cordillera during the Oligocene and Miocene, to the Subandean fold-and-thrust belt since ~ 10 Ma. However, in the Puna Plateau, apatite-fission track and sedimentologic data indicate that deformation was accommodated in a diffuse, complicated, and diachronous manner throughout the present plateau, similar to recent deformation along the current plateau margin. Notably, the plateau morphology persists from Bolivia into northwestern Argentina, despite these large differences in tectonic history and style.

In contrast, a common feature of the Puna-Altiplano plateau is that its location corresponds to hyper-arid areas of the landscape in which channels fail to incise deeply into basin sediments or through surrounding basement ranges. Importantly, in both areas the local base-level is hydrologically isolated from the foreland. This isolation appears to occur where the incising power of regional drainage systems has been greatly reduced due to a combination of diminished precipitation related to regional climate and local orography, and exposure of bedrock that is resistant to fluvial incision. We posit that hydrologic isolation of the plateau from the foreland permits wholesale deposition within basins as material is eroded from the surrounding ranges, reducing the relief

between basins and the surrounding peaks. While a variety of deformation styles and possibly combinations of different processes (e.g., distributed shortening, uplift related to lithospheric delamination, magmatic underplating) may generate the high elevations observed in the Altiplano-Puna plateau, the observed low-relief morphology requires evacuation of material via regional fluvial systems to be restricted. Therefore, we argue that the low-relief character of the Puna-Altiplano orogenic plateau may be a geomorphic, rather than a tectonic phenomenon. This may be true in some areas of other plateaus worldwide.