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Eccentricity-driven fluvial fill terrace formation in the southern-central Andes, NW Argentina

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Across the world, fill-terrace formation in glaciated catchments has been linked to variable sediment production and river discharge over glacial–interglacial cycles. Little is known, however, how variability in global climate may have affected rainfall patterns and associated surface-processes on multi-millennial timescales in regions far from major glaciers and ice sheets, and how those changes might be reflected in the landscape.
Here, we investigate the timing of fluvial fill terrace planation and abandonment in the Quebrada del Toro, an intermontane basin located in the Eastern Cordillera of the southern-central Andes of NW Argentina. Fluvial fills in the valley reach more than 150 m above the current river level. Sculpted into the fills, we observe at least 5 terrace levels with pronounced differences in their extent and preservation.
We sampled four TCN (in situ 10Be) depth profiles to date the abandonment of the most extensive terrace surfaces in locations, where subsequent overprint by erosion and deposition was not pronounced. We interpret unexpectedly low 10Be concentrations at shallow depths and surface samples to be related to aeolian input, causing surface inflation. Correcting the depth profiles for inflation results in a reduction of the terrace surface ages by up to 70 ka. The inflation-corrected ages fall within the late Pleistocene ($\sim$140 – 370 ka) and suggest a potential link to orbital eccentricity ($\sim$100 ka) cycles.
The studied fills in the Toro Basin document successive episodes of incision, punctuated by periods of lateral planation and possible partial re-filling. We propose climate cycles as a potentially-dominant factor in forming these terraces. To our knowledge, none of the previously studied fluvial terraces in the Andes date back more than 2 glacial cycles, thus making the Quebrada del Toro an important archive of paleoenvironmental conditions over longer timescales.