EGU2020-4887
https://doi.org/10.5194/egusphere-egu2020-4887
EGU General Assembly 2020

Reconstructions of past sediment and water discharges from fluvial-fill terraces in the southern Central Andes of NW Argentina

Stefanie Tofelde[1], Taylor Schildgen[2], Andrew Wickert[3], Manfred Strecker[1], and Ricardo Alonso[4]

[1]Institute of Geosciences, University of Potsdam, Potsdam, Germany (tofelde@uni-potsdam.de)
[2]Helmholtz Zentrum Potsdam, GeoForschungsZentrum (GFZ) Potsdam, Potsdam, Germany
[3]Department of Earth Sciences and Saint Anthony Falls Laboratory, University of Minnesota, Minneapolis, MN, USA
[4]Departamento de Geologia, Universidad Nacional de Salta, Salta, Argentina

Alluvial river long profiles continually adjust to their water discharge (Q_w) and sediment supply (Q_s). Q_w and Q_s are in turn functions of local climatic and tectonic conditions. Hence, changes in the prevailing tectonic or climatic conditions will trigger adjustments to channel long profiles, either by channel incision into previously deposited sediments or by sediment deposition. Because fluvial terraces are abandoned floodplains that preserve ancient river elevation profiles formed from past Q_s and Q_w, they store information on past climatic or tectonic conditions.

In NW Argentina, reconstructions of Pleistocene climate are sparse due to the limited availability of paleo-climatic records, such as stable isotope data from speleothems or lake cores. However, many intermontane basins within the Southern Central Andes of NW Argentina are characterized by multiple generations of fluvial-fill terraces, some of which date back several tens to hundreds of thousands of years. Here, we show that these geomorphic units provide an opportunity to extract information about paleo-climatic conditions.

A combination of several geochronological techniques has revealed the history of a >200-m-thick fluvial-fill terrace sequence within the Quebrada del Toro. The terrace sequence experienced alternating episodes of incision and aggradation since at least 500 ka. Subsequent terrace surfaces appear to have formed following a cyclicity of ca. 100 kyr. From detrital sediment within those fill terraces, past Q_s could be reconstructed for times of sediment aggradation based on cosmogenic ^{10}Be concentrations. The analyses revealed that over the last ~500 kyr Q_s has varied at most by a factor of 4, but overall has been relatively constant. As the slope of a river channel (and likewise, the slope of a well preserved terrace surface) is a function of incoming Q_s and Q_w, combining data of terrace slope and past Q_s allowed us to reconstruct past Q_w for the times represented by the ages of the terrace surfaces, which mark the onset of river incision. The analyses revealed that during these times, Q_w was 10 to 80% higher than today. The results are in line with the few existing quantitative estimates of past precipitation changes in the Central Andes, but have the advantage of extending further back in time. Moreover, the widespread occurrence of fluvial-fill terraces throughout the Central Andes offers the opportunity to reconstruct past Q_w with high spatial resolution, offering a new perspective regarding the impact of past climate changes on the

sediment-routing system through space and time.