Geophysical Research Abstracts
Vol. 16, EGU2014-6081-1, 2014
EGU General Assembly 2014

A modern analog of past climatic impacts on sedimentary processes and landscape evolution in an intermontane basin: The Del Medio fan, NW Argentina

Sara Savi (1), Taylor F. Schildgen (1), Stefanie Tofelde (1), Hella Wittmann (2), and Manfred Strecker (1)

(1) University of Potsdam, Institute of Earth and environmental Science, Potsdam, Germany (sara.savi@geo.uni-potsdam.de), (2) Deutsches GeoForschungsZentrum, GFZ, Potsdam, Germany

The combined effects of tectonic and climatic forcing govern the evolution of landscapes, setting the scale of topographic relief and the pace of landscape changes over time. Tectonic uplift or changes in precipitation regimes can fundamentally modify erosional processes and sediment flux from hillslopes, change river profiles, and ultimately impact depositional systems downstream. The complexity of the response, however, often means that we cannot predict a priori how a given landscape will react to future changes in climate, or how it responded in the past to multiple episodes of climate change.

The Del Medio catchment is located in the southern part of the Humahuaca Basin, an intermontane valley within the Eastern Cordillera in transition to the Puna Plateau. This area coincides with a climatic and vegetation divide between a sub-humid environment downstream and the semi-arid upper Humahuaca Basin. An extensive fan sourced in the Del Medio catchment covers ca. 18.6 km^2 of the basin outlet. The fan stratigraphy and surface morphology suggest that the fan dynamics are dominated by debris-flow processes. The surface comprises abandoned channels, levees and lobes, while exposed sections in channel cuts reveal unsorted, matrix-dominated deposits, with individual boulders reaching a diameter of 5 m. To investigate rates and timing of the Del Medio fan evolution, we analyzed cosmogenic ^{10}Be concentrations on the surfaces of large boulders from the fan surface, river sands in active channels, a depth profile, and bedrock exposed atop the drainage basin margins. Our preliminary CRN results illustrate the rapid rate at which the active fan surface is subject to change, with each of the 11 analyzed boulder samples providing ages of < 200 years. In addition, river sands record very high denudation rates that range from several mm/yr to tens of mm/yr, despite bedrock denudation rates from the basin margins of only 0.04 mm/yr. These contrasting denudation rates likely result from frequent landsliding and debris flows along the steep slopes of the catchment area, which generates sediment of near-zero cosmogenic nuclide concentrations.

Farther upstream in the more arid Humahuaca Basin, abandoned fluvial terrace sequences that exceed 100 m in thickness have been linked to wetter episodes during the late Quaternary. Within those fills, preliminary paleodenudation rates reach values similar to those currently observed in the Del Medio catchment, while modern denudation rates from river sands are similar to the low rates observed from bedrock samples. Taken together, these observations indicate that the Del Medio fan could be a modern analog of those older fill sequences, providing a unique opportunity to link present-day processes in the Del Medio catchment to those that were likely active in the past during wetter climate episodes in the Humahuaca Basin.