



## **Tectonically controlled denudation rates in the central Bolivian Andes**

Gerold Zeilinger (1), Florian Kober (2), Kristina Hippe (3), and Odin Marc (4)

(1) University of Potsdam, Institute of Earth and Environmental Science, Potsdam/Golm, Germany (zeilinger@geo.uni-potsdam.de), (2) NAGRA, Hardstrasse 73, CH-5430 Wettingen, Switzerland, (3) Institute of Geochemistry and Petrology, ETH Zurich, CH-8092 Zurich, Switzerland, (4) Helmholtz-Zentrum Potsdam - Deutsches GeoForschungsZentrum, Telegrafenberg, D-14473 Potsdam, Germany

A new dataset of  $^{10}\text{Be}$  (and  $^{26}\text{Al}$ ) catchment wide denudation rates from the Central Andean Rio Grande catchment exposes a strong zoning. The denudation rates - which integrate over millennial timescales - reveal 3-5 times faster denudation in the Subandean Zone (SAZ) (mean 0.8 mm/yr) than in the Eastern Cordillera (EC) and in the Interandean Zone (IAZ). The Rio Grande main reach drops approx. 5000 m when flowing from W-E through the EC, IAZ and SAZ physiographic provinces to the Chaco Plain at the E side of the Central Andes.

Local relief, mean slopes and channel steepness indices are largely similar across these physiographic regions. In addition, climatic parameters like precipitation do not show a significant gradient. The orientation of major structural trends and the predominant orientation of fluvial channels reveal in the EC and IAZ only little to uniform preferred orientation of drainages, suggesting a balance between structural control and drainage occupation. In contrast, the distinct pattern of drainages oblique to the structural grain in the SAZ controls the E-W alignment of tributaries and suggests a tectonic control on drainage orientation.

Based on above mentioned results and observations, we infer that seismic and tectonic activity in the Subandean belt generates and rejuvenates its topography. This is supported by a higher cumulative surface uplift in the thrust fault setting of the Subandes compared to the other regions. We conclude that the overall denudation rate signature of the Central Eastern Andes is dominated primarily by tectonic, and secondary, by climate and geological boundary conditions causing a complex pattern of geomorphic processes and responses. The absence of a distinct tectonic topographic signature in the Subandes might be caused by (1) landscape processes that evolve on scales that are not characteristic for a single geomorphic parameter and (2) partially by nonlinear responses.

Results from the outlet of the Rio Grande catchment at Abapó, located at the transition to the Chaco Plain, indicate that the current high denudation rates of the SAZ can be overprinted by headwater signals. Consequently, it requires caution when postulating tectonic and/or climatic forcing as the cause when such bypassing events affect the catchment area.

The above mentioned study is part of an integrated attempt for a better understanding of the processes of natural and current denudation and their spatial distribution as a basis for an assessment of erosion rates in the Rio Grande catchment and the planning of protective measures.