

EGU2020-13209

<https://doi.org/10.5194/egusphere-egu2020-13209>

EGU General Assembly 2020

© Author(s) 2022. This work is distributed under the Creative Commons Attribution 4.0 License.



Active surface deformation in the south-central Andes revealed by multiple-sensor InSAR, GNSS and field observations

Bodo Bookhagen¹, Manfred R. Strecker¹, Jonathan R. Weiss¹, and Ricardo N. Alonso²

¹Universität Potsdam, Institut für Geowissenschaften, Potsdam-Golm, Germany (bodo.bookhagen@uni-potsdam.de)

²National University of Salta (UNSa), Facultad de Ciencias Naturales (FCN), Argentina

With an average elevation of about 3.7 km the semi-arid to arid Central Andean Plateau (Altiplano-Puna) constitutes the world's second largest orogenic plateau. The internally drained region is characterized by compressional basin-and-range topography. Many of the basins in the Argentine sector of the plateau (Puna) are presently evaporitic salt pans, but during the Pleistocene the basins have repeatedly experienced high lake-level phases during pluvial periods. Due to protracted sedimentary infilling and sustained internal drainage conditions the basins have thick sedimentary sequences that have partially coalesced. The basins are bordered by reverse-fault bounded ranges, reaching 5 to 6 km elevation, but the history and extent of tectonic deformation in this region is not very well known. Global Navigation Satellite System (GNSS) data have been used to estimate decadal-scale tectonic shortening rates but the spatiotemporal pattern of surface deformation is complex and includes the compounding effects of subduction zone megathrust earthquake transients.

Here, we use a combination of field observations, cosmogenic nuclide dating of deformed alluvial-fan surfaces, Interferometric Synthetic Aperture Radar (InSAR), and GNSS data time series to quantify Quaternary to decadal-scale tectonic deformation. The arid mountain ranges provide ideal conditions to observe deformation from multiple sensors, including TerraSAR-X, Sentinel-1, ALOS2, and ENVISAT. Furthermore, we rely on 12 m TanDEM-X topographic data to characterize 10^3 - 10^6 yr surface deformation using cosmogenic nuclide exposure dating and digital elevation model analysis.

The Puna has been previously characterized as a region with little tectonic activity including very low levels of seismicity despite evidence for strike-slip and extensional faulting accompanied by mafic volcanism. The eastern plateau margins in particular record this type of kinematic regime, while the adjacent foreland is characterized by a higher level of seismicity and ongoing contraction. Here, we present evidence of ongoing contraction during the past two decades compatible with tectono-geomorphic phenomena that support the notion of tectonic shortening in the central Puna Plateau. For example, tilted shorelines associated with former lake-highstands along the flanks of an anticline and Neogene-Pleistocene growth strata associated with this structure indicate that shortening in this region has been sustained since the Neogene. InSAR and GNSS time series analysis permit the identification and characterization of previously

unrecognized tectonic activity in adjacent sectors of the intermontane basins, thus helping to improve our understanding of crustal dynamics in the Central Andes.