Fault initiation, exhumation, and propagation documented by low-temperature thermochronology in the Andean Precordillera, San Juan, Argentina

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Abstract

The central Andean Precordillera, between 30-31°S, has experienced active faulting and deformation from the early Miocene to present driven by a flat-slab segment of the down-going Pacific Plate. Basic models for fault propagation, in this region, involve progressive eastward stepping of deformation; however, out-of-sequence faulting has been postulated. Furthermore, deformation appears to have started earlier in the northern part of this region and later in the southern part. We use apatite (U-Th-Sm)/He (AHe) low-temperature thermochronology to quantify timing of fault exhumation and fault growth patterns to test hypotheses about out-of-sequence thrusting and the southward propagation of deformation in the region. Nine vertical transects were collected in the eastern-most part of the Precordillera. Preliminary AHe data indicate complete and partial age resetting in middle to late Miocene sedimentary units, that were deposited, buried, and subsequently exhumed. AHe ages range between 30 - 2 Ma and trend younger to the south, supporting previous suggestions of north to south deformation migration. Additionally, we use cosmogenic radionuclides (CRN) to assess modern erosion rates across the landscape. Initial erosion rates range from 22 – 1330 m/my, with generally lower rates in the north and higher rates to the south. Ongoing analysis and modeling of both thermochronologic and CRN data will help to constrain the recent exhumation and erosion history in the central Andean Precordillera and determine if combining these two techniques can be used to identify out-of-sequence faulting and changes in spatial patterns of tectonically driven deformation.

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