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Constraining the formation of the fault-bound Cianzo basin, NW Argentina using low-temperature thermochronology

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The transition from the Eastern Cordillera to the Santa Barbara System in NW Argentina is characterized by the inversion of pre-existing Cretaceous and Paleozoic structures. Within this complex fold-and-thrust belt, the Miocene Cianzo basin with its rich sedimentary and structural record tells the tale of Andean reactivation of an extensional fault system and the incorporation of the former Salta rift basin into the orogenic wedge. In the Cretaceous, the intracontinental Salta rift was widely distributed in NW Argentina, with multiple sub-basins radiating from a central high. The Cianzo basin, at that time situated at the northern margin of the ENE-WSW striking Lomas de Olmedo sub-basin, impressively shows the transition from condensed post-rift strata on top of the rift shoulder to thick, proximal syn- and post-rift strata of the Salta Group in the adjacent half-graben. These sediments were buried by up to 3 km of clastics from the approaching orogenic wedge, causing apatite (U-Th-Sm)/He (AHe) and, in part, apatite fission track (AFT) ages to be reset. In the Miocene, deformation reached the Eastern Cordillera, gradually dissecting the foreland basin along pre-existing faults and forming local depocenters such as the Cianzo basin, which is surrounded by inverted normal faults and basement block uplifts. Its unique structural setting and complete sedimentary record provide an excellent natural laboratory to study fold-and-thrust belt formation through reactivation of pre-existing structures. Although the structural and sedimentary characteristics of the Cianzo basin have been studied in detail, low-temperature thermochronology data to quantify deformation processes is lacking. We provide AHe, AFT and zircon (U-Th-Sm)/He (ZHe) cooling ages from 39 samples from the Cianzo basin and adjacent areas. Jurassic ZHe ages from the Aparzo ranges may reflect pre-Salta Group exhumation of the rift shoulder, an event which is also recorded in thick, proximal agglomerates that were shed into restricted depocenters. AHe and AFT data document a Middle-Late Miocene onset of rapid exhumation of the Abra de Zenta, Hornocal and Aparzo ranges that border the Cianzo basin. Furthermore, AHe and AFT ages constrain the sequence of deformation for large folds such as the Cianzo syncline. The new dataset refines the timing of reactivation of pre-existing normal faults that now bound the Cianzo basin and sheds a new light on the propagation of the Eastern Cordillera fold-and-thrust belt in time and space.

