EGU21-12429
https://doi.org/10.5194/egusphere-egu21-12429
EGU General Assembly 2021

Exhumation history of the Lomas de Olmedo basin: constraining multi-phase deformation using low-temperature thermochronology

Willemijn S.M.T. van Kooten[1], Edward R. Sobel[1], Cecilia del Papa[2], Patricio Payrola[3], Alejandro Bande[4], and Daniel Starck[4]

[1]Universität Potsdam, Institut für Geowissenschaften, Potsdam, Germany
[2]CONICET-CICTERRA, Córdoba, Argentina
[3]Universidad Nacional de Salta, Salta, Argentina
[4]TecPetrol S.A., Buenos Aires, Argentina

The Cretaceous period in NW Argentina is dominated by the formation of the Salta rift basin, an intracontinental rift basin with multiple branches extending from the central Salta-Jujuy High. One of these branches is the ENE-WSW striking Lomas de Olmedo sub-basin, which hosts up to 5 km of syn- and post-rift deposits of the Salta Group, accommodated by substantial throw along SW-NE striking normal faults and subsequent thermal subsidence during the Cretaceous-Paleogene. Early compressive movement in the Eastern Cordillera led to the formation of a foreland basin setting that was further dissected in the Neogene by the uplift of basement-cored ranges. As a consequence, the northwestern part of the Lomas de Olmedo sub-basin was disconnected from the Andean foreland and local depocenters such as the Cianzo basin were formed, whereas the eastern sub-basin area is still part of the Andean foreland. Thus, the majority of the Salta Group to the east is located in the subsurface and has been extensively explored for petroleum, while in northwestern part of the sub-basin, the Salta Group is increasingly deformed and is fully exposed in the km-scale Cianzo syncline of the Hornocal ranges. The SW-NE striking Hornocal fault delimits the Cianzo basin to the south and the Cianzo syncline to the north. During the Cretaceous, it formed the northern margin of the Lomas de Olmedo sub-basin, which is indicated by an increasing thickness of the syn-rift deposits towards the Hornocal fault, as well as a lack of syn-rift deposits on the footwall block. Structural mapping and unpublished apatite fission track (AFT) data show that the Hornocal normal fault was reactivated and inverted during the Miocene. Although structural and sedimentary features of the Cianzo basin infill provide information about the relative timing of fault activity, there is a lack of low-temperature thermochronology. Herein, we aim to constrain the exhumation of the Lomas de Olmedo sub-basin during the Cretaceous rifting phase, as well as the onset and magnitude of fault reactivation in the Miocene. We collected 74 samples for low-temperature thermochronology along two major NW-SE transects in the Cianzo basin and adjacent areas. Of these samples, 59 have been analyzed using apatite and/or zircon (U-Th-Sm)/He thermochronology (AHe, ZHe). Furthermore, 49 samples have been prepared for AFT analysis. The ages are incorporated in thermo-kinematic modelling using Pecube in order to test the robustness of uplift and exhumation scenarios. On the hanging wall block of the N-S striking east-vergent Cianzo thrust north of the Hornocal fault, Jurassic ZHe ages are attributed to pre-

Salta Group exhumation. However, associated thrusts to the south show ZHe ages as young as Eocene-Oligocene, which might indicate early post-rift activity along those thrusts. AHe data from the Cianzo syncline show a direct age-elevation relationship with Late Miocene-Pliocene cooling ages, indicating the onset of rapid exhumation along the Hornocal fault in the Miocene. This is consistent with regional data and suggests that pre-existing extensional structures were reactivated during Late Miocene-Pliocene compressive movement within this part of the Central Andes.