



102-5 - SPATIO-TEMPORAL EVOLUTION OF THE TANGRA YUMCO RIFT, SOUTH-CENTRAL TIBET: INSIGHTS FROM ZIRCON (U-TH)/HE THERMOCHRONOMETRY



Monday, October 11, 2021

2:35 PM - 2:50 PM



Oregon Convention Center - B115/B116 (Hybrid Room)

Abstract

The Tangra Yumco (TYC) rift in south-central Tibet is one of the longest (~250 km) N-S striking rifts on the Plateau, providing an ideal natural laboratory to test dynamic models of extension through geologic mapping, zircon (U-Th)/He thermochronology (ZHe), and thermo-kinematic modeling. We utilize the ZHe method to determine spatio-temporal trends in extension onset and rates, which are compared to predictions for the following dynamic models: (1) removal of dense lithosphere, (2) weakening of Tibetan lithosphere, (3) decreasing horizontal collisional stress, and (4) increasing crustal thickness by underthrusting India. Most models constrain onset of extension to mid-Miocene time (~16-12 Ma), but struggle to reconcile an observed acceleration of extension rates ~5-10 Myr later. India underthrusting links rift acceleration to the northward propagation of India beneath Asia, but has been tested in only one locality. Relationships between fault displacement over time, age of extension onset, and timing and rates of exhumation may also reveal mechanisms of regional fault growth.

We present a 1:100,000 scale geologic map of ~2,000 km² in the southern TYC rift and new ZHe dates across key structural relationships. TYC is bounded by two approximately north striking high angle (~45-70°) active normal faults that alternate dominance along strike. Quaternary alluvial fan deposits in the central rift hanging wall display synthetic graben structures, whereas in northern and southern rift segments, a stepped sequence of high angle normal faults cut Quaternary deposits and likely sole into the rift-bounding faults at depth. Pervasive northeast dipping foliation is observed in the exhumed footwall granodiorite, with slip lineations and fault plane striations suggesting northeast directed oblique sinistral-normal slip. Seventy single-grain ZHe analyses yield dates between 25.72 Ma and 7.58 Ma, with median dates between ~23 Ma and ~8 Ma. Sample transects from the footwall indicate an older in the south (~20 Ma) to younger in the north (~8 Ma) trend in rift age along strike, in agreement with India underthrusting model predictions. This detailed work from the TYC rift may yield insights into fault growth mechanisms and dynamic processes driving changes in crustal thickness and topographic evolution during orogenesis.

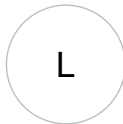
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