

2-6 - MIOCENE SLIP ALONG THE SOUTHERN SIERRA NEVADA RANGE FRONT NORMAL FAULT: PRELIMINARY LOW-TEMPERATURE THERMOCHRONOLOGY RESULTS

 Tuesday, 12 May 2020

 11:00 AM - 11:20 AM

 *The Westin Pasadena - Plaza Room*

Abstract

The topographic development of the Sierra Nevada, California has been the topic of research for more than 100 years, yet disagreement remains as to whether the Sierra Nevada records (a) uplift in the late Mesozoic followed by no change or a decrease in elevation throughout the Cenozoic, or (b) uplift in the late Mesozoic followed by a decrease in elevation during the middle Cenozoic, and a second pulse of uplift in the late Cenozoic. A wide variety of data sets underpin both hypotheses. Proponents implicitly or explicitly link late Cenozoic uplift to normal slip along the Sierra Nevada frontal fault zone (SNFFZ), yet the late Cenozoic slip history along the southern SNFFZ has not been documented. As a pilot test of these two hypotheses, we report preliminary apatite (U-Th/He) (AHe) and fission track (AFT) results from low-elevation samples collected along two vertical transects in the footwall of the SNFFZ up the eastern escarpment of the southern Sierra Nevada. In the region of the northern transect, exposed bedrock fault planes and associated joints dip 63°E and 66° E. In the region of the southern transect, fault planes and joints are not exposed. Along the northernmost transect, AHe ages range from 14.7 to 30.4 Ma. The five lowest elevation samples, over a vertical distance of 325 m, yield an elevation invariant mean age of ~18.2 Ma. Samples from the southernmost transect yield AHe ages of 10.9 to 19.4 Ma, with the lowest elevation sample yielding an AFT age of 50 Ma and mean track length of 13.1 microns. The five lowest elevation AHe samples, over a vertical distance of 300 m, yield an elevation invariant mean age of ~12.0 Ma, whereas the higher three samples, over a vertical distance of 215 m, yield an elevation invariant mean age of ~18.5 Ma. Preliminary HeFTy modeling of the AHe and AFT ages from the lowest sample yield two periods of accelerated cooling during the Miocene. We interpret the elevation invariant ages and the HeFTy model results as indicating two periods of exhumation in the footwall of the SNFFZ due to normal slip along the SNFFZ. Our preliminary results are the first to document Miocene cooling (normal slip) along the SNFFZ. Miocene age normal fault slip along the SNFFZ is broadly synchronous with normal slip along range bounding faults throughout this part of the Basin and Range.

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