

Thesis Defense



William Barba

MS Candidate

Under the Supervision of
Professor Michael Wells

Friday, November 6th, 2020 @ 2:00pm

Zoom: <https://us02web.zoom.us/j/81876683666?pwd=RytybkZReEVhaRTZGRFcTVVbDRHUT09>

Tectonic evolution of the Tucki Mountain metamorphic core complex, Death Valley, CA

The exhumation of Cordilleran metamorphic core complexes (MCCs) from mid-crustal depths has traditionally been associated with Cenozoic, post-Laramide extension. However, it has become increasingly evident that extensional tectonic exhumation of numerous MCCs initiated in the Late Cretaceous, during construction of the Sevier-Laramide orogen. New geologic mapping and structural analysis integrated with geochronology and thermochronology data provide evidence for a Late Cretaceous extensional shear zone, previously interpreted as Miocene in age, within the Tucki Mountain MCC on the western flank of Death Valley, California. The shear zone occurs within the immediate footwall of the Miocene-Pliocene Tucki Mountain detachment fault system where middle and upper greenschist facies Kingston Peak and Noonday formations display a penetrative top-NNW shear fabric. Deformation temperatures of the mylonitic rocks were estimated through petrographic observation of the dominant quartz and feldspar recrystallization mechanisms, which suggest temperatures ca. 400-500°C. These observations were compared with muscovite and K-feldspar $^{40}\text{Ar}/^{39}\text{Ar}$ thermochronology data from several samples along a transect parallel to the shear direction. The majority of muscovite step heating analyses show well-defined age gradients, a departure from linearity or a “knee” in the Arrhenius data, and a strong correlation between the $\log(r/r_0)$ plots and their corresponding age spectra. These observations are highly characteristic of multiple diffusion domain (MDD) behavior and led us to apply the MDD method to both muscovite and K-feldspar, which when combined, allows for the recovery a continuous thermal history from ~ 425 -150°C. MDD modeling of Late Cretaceous igneous rocks show cooling through 400°C between ~ 85 -70 Ma and continued cooling at rates of 10-30°C/m.y. down to 250°C by no later than ~ 50 Ma. This constrains the timing of fabric development as Late Cretaceous in age, which is supported by a 72 Ma intrusion which we interpret to be synkinematic with respect to top-NNW shear. The Tucki Mountain MCC is one of several “Cenozoic” MCCs that now show evidence for initial Late Cretaceous unroofing and adds to the growing body of evidence for widespread extensional tectonism throughout the Late Cretaceous Sevier-Laramide orogen.

Committee members:

Dr. Michael Wells, Dr. Wanda Taylor, Dr. Francis Macdonald, and Dr. Dennis Bazylnski

UNLV
Department of
GEOSCIENCE