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TRACKING THE ESCALATOR RIDE FROM MID-CRUSTAL DEPTHS TO THE SURFACE: NEW CONSTRAINTS ON THE PACE AND EPISODICITY OF LATE EOCENE TO MIOCENE EXHUMATION FROM THE SOUTHERN EAST HUMBOLDT RANGE METAMORPHIC CORE COMPLEX, ELKO COUNTY, NEVADA

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A ~20 km long transect of $^{40}Ar/^{39}Ar$ and (U-Th)/He samples subparallel to transport direction in the southern East Humboldt Range record a two-phase exhumation history with the up-dip part of the core complex recording Late Eocene cooling whereas the more extensive down-dip segment cooled rapidly in the early Miocene. Based on a newly discovered Ms-Bt-Pl-Ky-Grt, peak PT conditions contemporaneous with Late Cretaceous leucogranite intrusions in the southeastern East Humboldt Range likely exceeded 600 °C and 6 kb. Rocks underlying the mapped detachment fault in this area cooled through closure of the $^{40}Ar/^{39}Ar$ biotite and muscovite systems (~350 – 450 °C) and (U-Th)/He zircon system (~180 °C) between 42 Ma and 36 Ma— broadly coincident with eruption of intermediate volcanics in the hanging wall and quartz dioritic intrusions in the footwall. In addition, it coincides with upper crustal normal faulting documented by Pape et al. (2015) ~30 km to the SE in the neighboring Spruce Mountains. Subsequent cooling slowed dramatically, with high eU zircons yielding Oligocene ages whereas apatite yields ages of 19.8 ± 2.2 Ma. Argon loss patterns in some micas suggests that cooling and unroofing continued well into the Miocene. In contrast to the southeastern part of the range, the entire western flank of the range records $^{40}Ar/^{39}Ar$ biotite and muscovite closure between 23.23 and 19.63 Ma, younging to the WNW in the transport direction. Consequently, the farthest west samples were cooling through white mica closure temperatures (~450 °C) at the same time that up-dip parts of the lower plate 18 km to the SE were cooling through (U-Th)/He apatite closure temperatures (~65 °C). For assumed paleogeothermal gradients of 25 - 45 °C/km this disparity implies that the part of the detachment expected to be seismogenically active during early Miocene exhumation probably dipped at angles of at least 20° to 45° in dramatic contrast to its current flat geometry. Taken together, the data record two distinct extensional pulses of core complex exhumation-- one primarily in the Late Eocene, and the other beginning by the early Miocene (though likely continuing through the Middle Miocene). Intermediate ages could reflect either continued extension at a much reduced rate or prolonged residence in the partial retention zone.

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T136. Tick Tock in the Rock: Elucidating the Time Scales of Geologic Processes and Honoring the Contributions of Bruce Watson, 2018 Roebling Medalist
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