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INTEGRATING THERMOCHRONOLOGIC, THERMOBAROMETRIC AND DEFORMATION PATH ANALYSIS TO CONSTRAIN THE PACE, EVOLUTION AND TECTONIC SIGNIFICANCE OF A DEEP-CRUSTAL SHEAR ZONE: A CASE STUDY FROM THE RUBY MOUNTAINS-EAST HUMBOLDT RANGE METAMORPHIC CORE COMPLEX, NEVADA

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Understanding the tectonic significance and evolution of deep-seated shear zones is an essential but formidable challenge facing regional tectonic analysis. We illustrate a case study integrating microstructural constraints based primarily on SEM-EBSD analysis mylonitic quartzites integrated with independent thermochronometric and thermobarometric constraints from the Ruby Mountains-E Humboldt Range (REH) shear zone of northeastern Nevada. Prior work documents a multi-stage exhumation history beginning as early as the Late Cretaceous, but the final stage of exhumation began after ~25 Ma and exhumed rocks from mid-crustal depths (F 600 ± 30 ^{o}C, 340 ± 30 MPa) on a WNW-rooted extensional shear zone at least 500 m thick, with mylonitization occurring in equilibr with meteoric fluids during cooling to ~450 °C at shear stresses of 19-32 MPa and strain rates of 10^{-10} to 10^{-13} s^{-1}. $^{40}Ar/^{39}Ar$ mica Kfs thermochronology record progressive footwall cooling to temperatures below the estimated conditions of mylonitization by ~21 with continuing deformation focusing into the upper part of the mylonitic zone and eventually onto a brittle detachment fault that exhumed the footwall through U-Th/He zircon and apatite closure by ~11 Ma for a total displacement of ~20 km. Determining the kinematic vorticity of mylonitization is a key test for discriminating whether displacement occurred on a crust-penetrating low-angle simple shear zone or a subhorizontal mid-crustal decoupling zone separating the brittle upper crust from a more homogeneously stretching deeper crustal layer. A Schmid factor analysis of quartzite mylonite from the Secret Creek Gorge area between the two ranges indicates that the dominant quartz slip systems were unfavorably oriented for slip in simple shear. Rather, the dominant r, z and π' <a> slip systems appear to be counterbalanced by antithetic slip on the prism <a> or <a+c> systems ideally configured for stable (irrotational) deformation to high strains at a kinematic vorticity $W_k \approx 0.88$. Thus, the deeper levels of the REH shear zone appear to have acted as a stretching shear zone accommodating dislocation of the upper crustal hanging wall block relative to a homogeneously stretching domain in the deeper crust.

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T35. Midcontinent Precambrian Basement from the Superior Province to the Southern Appalachians
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