
253-10 - EFFECT OF WATER-ROCK RATIO ON THE STABLE ISOTOPE RECORD OF FLUID-ROCK- DEFORMATION INTERACTIONS IN DETACHMENT SHEAR ZONES



Wednesday, 18 October 2023



4:00 PM - 4:15 PM



326 (3, David L Lawrence Convention Center)

Abstract

Oxygen and hydrogen stable isotope analyses on quartz and muscovite veins from the footwall of the Raft River detachment shear zone (Utah) provide insight into the hydrology and fluid-rock interactions during ductile deformation. Samples were collected from veins containing 90-100% quartz, with orientations either at a high angle or sub-parallel to the surrounding quartzite mylonite foliation. Stable isotope analysis is performed on ten of the collected samples and compared to previous quartzite mylonite datasets. The results indicate that the fluid present during deformation of the shear zone was meteoric in origin, with a $\delta^2\text{H}$ value of approximately -100‰ and a $\delta^{18}\text{O}$ value of approximately -13.7‰. ^{18}O depletion correlates with muscovite content of the analyzed rocks, so we suggest that muscovite can be used as a proxy for isotopic equilibrium. Many of the analyzed samples in this and other studies show an apparent lack of equilibrium between the oxygen and hydrogen isotope systems, which we explain by developing models of combined hydrogen and oxygen isotope exchange at varying fluid-rock ratios. Our results suggest that the Raft River detachment shear zone had low fluid-rock ratio (<0.1), suggesting that it experienced episodic influxes of fluids through semi-brittle structures, and that fluid was then expelled out into the surrounding mylonite following progressive shearing, causing further ^{18}O -depletion and fluid-related embrittlement.

Geological Society of America Abstracts with Programs. Vol. 55, No. 6, 2023
doi: 10.1130/abs/2023AM-394184

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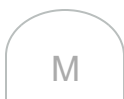
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