276-3 - FEEDBACK BETWEEN DEFORMATION AND FLUID FLOW IN THE RAFT RIVER DETACHMENT SHEAR ZONE (UTAH)

Wednesday, 12 October 2022

2:00 PM - 6:00 PM

Exhibit Hall F (Colorado Convention Center)

Booth No. 168

Abstract

Fluids play a profound role on the rheological weakening of faults and shear zones strongly influencing the thermomechanical behavior of the crust. Brittle faulting in the upper crust can increase permeability, enhancing fluid flow into and along fault zones. However, while stable isotope geochemical analyses of synkinematic minerals demonstrate that the footwalls of detachment shear zones are permeated by meteoric fluids. How surface-derived water gets pumped beyond the brittle-ductile transition and interact with the deforming mylonitic rocks remains a conceptually challenging physiomechanical process. Structural, microstructural, and geochemical analyses from the Miocene Raft River detachment shear zone provide insight into fluid-rock interaction during ductile deformation. Preliminary oxygen and hydrogen isotope analyses of quartz and synkinematic muscovite collected from high-strain area near the bottom of the shear zone reveal oxygen isotope equilibrium while under- and over-laying mylonite are clearly out of equilibrium. These results indicate that fluid flow is channelized in the investigated high strain zone within the shear zone, where higher permeability likely enhanced fluid flow and promoted isotopic equilibrium compared to the less strained rocks. This investigation suggests that the overall pattern of oxygen isotope preserved in quartz and muscovite reflect bulk chemical changes that resulted from positive feedback between channelized fluid flow and strain localization during the evolution of the shear zone.

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