

GSA Connects 2022 meeting in Denver, Colorado

Paper No. 276-6

Presentation Time: 2:00 PM-6:00 PM

DUCTILE STRAIN IN THE FOOTWALL OF THE SCHELL CREEK RANGE DETACHMENT SYSTEM, EASTERN NEVADA, USA: IMPLICATIONS FOR PRE-EXTENSIONAL GEOMETRY

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Ductile strain in the footwalls of detachment faults can make a large contribution to the overall strain field, yet is often not accounted for in reconstructions of extension. The Northern Snake Range core complex in eastern Nevada exposes ductilely sheared Neoproterozoic-Cambrian metasedimentary rocks in the footwall of the top-down-to-ESE Northern Snake Range décollement (NSRD). Recent studies in the Schell Creek Range to the west have interpreted the top-down-to-ESE Schell Creek Range detachment system (SCRDS) as the breakaway zone for the NSRD. The footwall of the SCRDS exposes the same rock units as those beneath the NSRD and provides an opportunity to quantify ductile strain beneath the breakaway of a major detachment fault system.

We utilized the Rf- ϕ method on detrital quartz clasts to measure 3D strain ellipsoids from 19 samples of Neoproterozoic-Cambrian quartzites that span 0.1-4.3 km structural distance below the SCRDS. Rs(XZ) values range from 1.4-1.9 (average 1.6) and Rs(YZ) values range from 1.2-1.7 (average 1.5), with ϕ -values typically within 8° of bedding. This corresponds to average values of 20% X extension, 11% Y extension, and 25% bedding-subnormal (Z) shortening. No trends in strain magnitude were observed with transport-parallel distance or structural height beneath the SCRDS. These data define low-magnitude, bedding-subnormal flattening strain.

X directions in our samples are dominantly NNW-trending, which indicates that the SCRDS footwall was not overprinted by the ESE-trending X direction that typified ~38-22 Ma ductile extension below the NSRD. Thus, flattening strain in the SCRDS footwall pre-dated regional extension, which is consistent with published thermochronometry that indicates that the SCRDS footwall had cooled below the quartz crystal-plastic transition (~300°C) by ~50 Ma. Our data are consistent with published interpretations that NNW-trending linear fabrics in the Schell Creek Range were the result of low-magnitude ductile stretching during Jurassic-Cretaceous contractional deformation. The gentle flattening strain that we documented likely represents the regional background strain magnitude prior to Paleogene extension on the SCRDS-NSRD system, which provides an important initial condition that ductile strain below the NSRD can be restored to.

Session No. 276--Booth# 171

[T39. New Insights into the Evolution and Geodynamics of Metamorphic Core Complexes in North America and Around the World \(Posters\)](#)

Wednesday, 12 October 2022: 2:00 PM-6:00 PM

Exhibit Hall F (Colorado Convention Center)

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[Back to: T39. New Insights into the Evolution and Geodynamics of Metamorphic Core Complexes in North America and Around the World \(Posters\)](#)

[<< Previous Abstract](#) | [Next Abstract >>](#)