

Joint 120th Annual Cordilleran/74th Annual Rocky Mountain Section Meeting - 2024

Paper No. 11-14

Presentation Time: 9:00 AM-5:30 PM

EXTREME DUCTILE THINNING OF CAMBRIAN MARBLES IN THE FOOTWALL OF THE NORTHERN SNAKE RANGE METAMORPHIC CORE COMPLEX, NEVADA: IMPLICATIONS FOR EXTENSION MAGNITUDE AND STRUCTURAL EVOLUTION

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Documenting the geometry, magnitude and kinematics of ductile deformation provides important insights into the structural and rheological evolution of continental lithosphere. The Northern Snake Range metamorphic core complex in eastern Nevada provides an exceptional opportunity to investigate the geometry and magnitude of ductile strain during high-magnitude continental extension. Decades of mapping-based research has provided exceptional stratigraphic context for the footwall of the low-angle, top-down-to-ESE, normal-sense Northern Snake Range décollement (NSRD). In the northern part of the range, Middle-Late Cambrian marble units in the NSRD footwall, which have a cumulative stratigraphic thickness of 1107 ± 107 m in adjacent ranges, were ductilely thinned during Late Eocene-Late Oligocene extension. From west to east across the range, these rocks have been thinned from 869-935-m-thick (15-21% structural thinning) to 54-88 m-thick (92-95% structural thinning) across a 12 km lineation-parallel distance. Ductile extensional strain was accompanied by the development of pervasive linear-planar fabrics and produced megaboudins of calcareous schist units that are ~100-500-m-long, ~15-25-m-thick, and separated by as much as ~1000 m. The magnitude of subhorizontal, ESE-directed, lineation-parallel ductile extension increases eastward across the range from $24 \pm 21\%$ to $1226 \pm 256\%$, and total ductile extension across the range is 12.1 ± 2.2 km ($167 \pm 31\%$). Quartz recrystallization microstructures and published calcite-dolomite thermometry indicate deformation temperatures of ~400-550 °C during initial Late Eocene-Late Oligocene ductile extensional shearing. NSRD footwall rocks in the eastern part of the range experienced a longer ductile extensional strain history and a prolonged residence time at higher temperatures compared to the western part of the range. This was facilitated by the progressive eastward migration of denudation-related cooling and was likely enhanced by shear heating that scaled eastward with strain magnitude, and/or a possible eastward increase in burial depth. These factors promoted the development of the extreme ductile strain gradient in the NSRD footwall across the Northern Snake Range.

Session No. 11--Booth# 48

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Wednesday, 15 May 2024: 9:00 AM-5:30 PM

Grand Ballroom (Davenport Grand Hotel)

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