

## **Minerals, Mountains, and Eleven Orders of Magnitude of Intra-continental Deformation: Monazite in the Context of Metamorphic and Igneous Tectonites**

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The career of Maria Luisa Crawford represents the work of a pioneer in the integration of astute field observations and hard rock petrogenesis. Crawford and several workers transformed the Coast Mountains of Alaska and British Columbia into a world-class laboratory for understanding the dramatic interaction of plutonism, metamorphism, and strain partitioning. Inspired by her application of “structural petrology,” we highlight the integration of petrogenesis, structural geology, isotope geochronology, and in situ high-resolution EMP monazite geochronology.

The Grease River shear zone (GRsz) is a ~7 km-wide, >400 km-long shear zone that cuts the East Athabasca granulite terrane, one of the world’s largest exposures of lowermost continental crust (>20,000 km<sup>2</sup>). The shear zone has a NE-striking, steeply NW-dipping (S<sub>2</sub>) foliation with a shallowly SW-plunging stretching lineation dominated by dextral SW-over-NE kinematics, similar to several Paleoproterozoic shear zones in the western Churchill Province. Monazite EMP and zircon ID-TIMS geochronology document a protracted history of sub-horizontal NW-SE shortening and sub-simple shear strain during the regional exhumation of this deep crustal terrane. Pre-GRsz dikes dated by high-precision zircon ID-TIMS techniques at 1.922 Ga cut a penetrative shallow fabric (S<sub>1</sub>). Syn-kinematic monazite domains are aligned in the shear zone fabric and yield ages that range 1.9-1.85 Ga. High-Y overgrowths on Mnz are linked to Grt-breakdown and correlated with exhumation accommodated along the ca. 1.85 Ga Legs Lake dextral oblique thrust-sense shear zone to the east. Hence, the GRsz accommodated strike-slip deformation in the upper plate of a large thrust system during regional exhumation.

Dextral strain is correlated with movement along the Great Slave Lake shear zone, a structure nearly 1,000 km in strike-length that bounds the southeastern margin of the Slave Province (dated between 1.92 and 1.86 Ga in the Athapuscow aulacogen). The region between the two shear zones represents >200,000 km<sup>2</sup> of the western Canadian Shield affected by Paleoproterozoic, intra-continental, dextral transpression related to indentation by the Slave Province to the NW and the Superior Province to the SE.

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