Evolution of the Chelan migmatite complex: New insights from LA-ICPMS U-Pb and REE zircon analysis

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The Chelan migmatite complex (CMC), crops out on the eastern flank of North Cascade Range of Washington, USA. A protracted history of magmatism and metamorphism complicate interpretation of geochronological data. Here we present new data based on "split stream" LA-ICPMS zircon analyses, permitting simultaneous zircon U-Pb dating and REE analysis from a single laser spot.

Pre-CMC protoliths include arc plutonic and volcanic rocks of Triassic (ca. 230 - 210 Ma) and Jurassic (ca. 170 – 165 Ma) age. Jurassic plutonic rocks in particular are well represented in the CMC, strongly modified by a major, ca. 115 – 110 Ma magmatic/anatectic event. The original Jurassic zircon shows minor replacement and overgrowth by 115 – 110 Ma zircon in some cases, and complete overgrowth by magmatic 115 – 110 Ma zircon in others. Some of the ca. 115 – 110 Ma zircon replacements and overgrowths have slightly *flatter* HREE patterns that cross-cut the Jurassic protolith zircon HREE patterns, suggestive of greater pressures of crystallization for the younger zircon.

Zircon from continuing major magmatic activity between ca. 110 and 100 Ma has HREE patterns similar to those for the overgrowths discussed above, but are in turn overgrown by still younger zircon in the range of 100 – 95 Ma, or even slightly younger. These younger overgrowths have *steeper*, cross-cutting HREE patterns compared to the 110 – 100 Ma zircon, suggestive of lower pressures of crystallization for this latest stage of zircon overgrowth. We suggest that the combined zircon geochronology and REE data constrain an initial deep burial of protolith rocks (pre – ca. 115 Ma), and initiation of major upwelling of the CMC at ca. 100 – 95 Ma.