

Constraining the Metamorphic History of the Wilson Lake Terrane, Labrador, Using Electron Microprobe Dating of Monazite

Kristina M. Gross
Mt. Holyoke College

The metamorphic events that occurred in western Labrador remain foggy. The Grenville orogeny has affected Western Labrador to various degrees, but abundant tectonic and geochronological evidence exists of an early Paleohelikian event (~ 1670 Ma) termed the Labradorian orogeny (Thomas et al., 1986). These rocks display amphibolite and granulite grade assemblages. What event, however, do these assemblages represent? K/Ar dates from biotite yield 950 ± 150 Ma (Thomas et al., 1986). U-Pb concordia diagrams for zircon and monazite fractions from the Wilson Lake terrane and nearby Lac Joseph yield upper intercept ages of 1660-1606 Ma and Grenvillian lower intercept ages typically 990-1060 Ma (Connelly and Heaman, 1993; James et al., 2002).

The Wilson Lake terrane (WLT) is dominated by high-grade gneiss derived primarily from pelitic and semipelitic rocks, locally and orthogneiss derived from granodiorite and diorite. The WLT is a roughly rectangular massif of granulite facies rocks including sapphirine-quartz and hypersthene-sillimanite-quartz assemblages. Monazites in two samples of WLT have been dated by electron microprobe methods. One is charnockitic gneiss containing opx + sill + kfs + plag + qtz + opaques, and the other is a sapphirine-bearing granulite containing perthite + sapph + sill + qtz + bio + opaques.

High-resolution Y, Th, U and Ca composition maps of 9 monazite grains show that some grains are fairly homogeneous, and others have minor zoning patterns with a core grading out to the rim. Detailed spot analyses from six monazite cores in the sapphirine-bearing sample give ages of 1652 (± 5), 1650 (± 12), 1643 (± 10), 1640 (± 11), 1623 (± 6), and 1596 (± 12) Ma (standard error in parentheses). Rim analyses for three of these grains give 1563 (± 10), 1553 (± 34), and 1502 (± 17) Ma. Two grains from the charnockitic gneiss give core ages of 1652 (± 5) and 1625 (± 9) Ma, and one rim age of 1563 (± 10) Ma. These monazite ages are consistent with tectonism associated with the Labradorian Orogeny that is interpreted as the result of imbrication and accretion of the Labradorian terranes to the Laurentian margin. We hope to find monazite within samples of undeformed pegmatite to determine if these rocks are Grenvillian.