
**Electron microprobe study and chemical dating of
Paleoproterozoic metamorphic monazites**

SIMON GAGNE¹, REBECCA A. JAMIESON¹,ROBERT A. MACKAY¹, AND DAVID CORRIGAN²

1. *Department of Earth Sciences, Dalhousie University, Halifax, NS
B3H 3J5, Canada <sgagne@is2.dal.ca> ¶* 2. *Geological Survey of
Canada, 615 Booth Street, Ottawa, ON K1A 0E9, Canada*

Metamorphic grade in the metapelite of the Paleoproterozoic Longstaff Bluff Formation, Trans-Hudson Orogen, ranges from upper greenschist to granulite facies. An electron microprobe study of monazite was carried out on grains of various grades and textural settings. Major element and trace element contents and mapping were used to investigate the effects of progressive metamorphism on monazite. Major element analyses were used to document chemical variation with metamorphic grade and mineral assemblage. Monazite Y content increases from low grade to high grade with a significant jump at the sillimanite isograd. This may result from consumption of xenotime, an important Y-sink, at higher metamorphic grade. The U and Th contents also increase with higher metamorphic grade. There is a corresponding decrease in total REE content due to substitutions for U, Th, and Y. Trace element (Pb, U, Th, and Y) analyses combined with chemical maps allow calculations of chemical ages (the CHIME method). Calculation of the error is based on counting statistics. Errors on spot ages vary from 2 to 5% at the 2-sigma level, depending on the Pb and U content of the grains. Multiple analyses within a single grain can reduce the statistical error to ~1%. CHIME results from the Longstaff Bluff Formation yield ages ranging from 1760 to 1890 Ma, with main clusters at ~1800 Ma, ~1830 Ma, and ~1850 Ma, and minor clusters at ~1760 Ma and ~1910 Ma. The main clusters agree well with TIMS analysis of monazites from the same area. The minor clusters have not yet been correlated with known ages. The younger cluster may represent small monazite grains not normally recovered during mineral separation for TIMS work. The significance of the older cluster is still unclear. The main age clusters are found in monazites of all metamorphic grades. Older ages are more present in higher grade monazites and the ~1910 Ma age is only found in the highest grade monazites. The ~1760 Ma is restricted to the lower grade samples.