Monazite (U-Th-Pb) dating of polyphase tectono-metamorphic deformation in the Government Point formation, Jordan Falls, southwestern Nova Scotia

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The ages of monazite crystals from metapelitic rock samples from the Jordan Falls region of southwestern Nova Scotia have been examined using in-situ dating methods. The rocks are from the Government Point formation of the Goldenville Group which is characterized as an andalusite-staurolite-cordierite granofels. The protoliths are thought to be turbiditic sediments deposited off the passive margin of Gondwana and subsequently deformed during the assembly of Pangaea. The equilibrium mineral assemblage suggests medium- to low-P (amphibolite-facies) metamorphic grade formed under conditions of approximately 550°C and 2.5 kb. These metasedimentary rocks contain an inclusion-rich staurolite poikiloblastic fabric that has been overprinted by inclusion-free staurolite poikiloblasts. These textures are interpreted as evidence of polyphase metamorphism and deformation associated with the early- to mid-Devonian Neoacadian orogeny. Monazite, a LREE phosphate, is widely used as a chronometer due to its unique chemical signature and high Th and U contents. Electron microprobe textural and chemical microanalysis has been performed on samples from the region. These data are combined with Laser-Ablation Induced Coupled Plasma Mass Spectrometry (LA-ICPMS) total Th-U-Pb monazite chronology that has been used to constrain the timing of the distinct tectono-metamorphic deformation events recorded by these samples. Compositional mapping of monazite grains in these rocks has identified concentric zonation defined by Y concentration resulting from the breakdown of garnet, staurolite, and xenotime under prograde and retrograde metamorphic conditions. This strongly suggests multiple growth stages of monazite. Chronology of the individual compositional domains within monazite grains yielded distinct ages that represent the main metamorphic events that affected the rocks of southwestern Nova Scotia.

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