

The structural and metamorphic evolution of the northern New Quebec Orogen of northern Quebec, Canada

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The New Quebec Orogen (NQO) is a Paleoproterozoic orogenic belt located in the southeastern Churchill Province of northern Quebec. The NQO formed as a result of the collision of the Superior Craton and the Archean Core Zone during the formation of the supercontinent Nuna and is considered an extension of the Trans-Hudson Orogen. The NQO is divided into a western foreland, the Kaniapiskau Supergroup (KS), and an eastern hinterland, consisting of the Rachel-Laporte (RLZ) and Kuujuaq zones. The KS and the RLZ represent metamorphosed and deformed passive margin rocks and are the focus of the current study. Three major episodes of deformation, including two compressional events associated with the initial collision, and one late oblique, dextral, compressional event have been previously identified. These events resulted in the general NNW-SSE structural trend of the orogen. Metamorphic grade increases from sub-greenschist facies in the western KS to upper amphibolite in the eastern RLZ and to granulite facies in the Kuujuaq Zone.

Over 200 samples and 600 orientation measurements were collected across a 40 km transect of the forelandhinterland transition of the northern NQO. Metapelitic rocks were of most emphasis during sample collection as they best record both deformation and metamorphic history. Structural analyses were conducted through a combination of stereonet, cross-section and thin section analyses of 50 thin sections. Petrographic studies were conducted to determine the number of metamorphic events and the relative temporal relationship between deformation and metamorphism. Garnet-biotite geothermometry of five samples constrain metamorphic temperatures, and pseudosection construction with Theriak-Domino of nine samples constrain pressure and temperature conditions. Finally, precise in-situ U–Pb geochronology was conducted on metamorphic monazite (one sample) and titanite (three samples) to determine ages of metamorphism.

A total of seven distinct sets of structures relating to deformation events (D_1 – D_7) were identified and their effects across the orogen described. Three metamorphic events were identified (M_1 – M_3), occurring syn- D_1 , inter- D_4 and D_5 , and syn- D_5 , with peak metamorphism identified as M_2 . Evidence of peak metamorphism is preserved as garnet porphyroblasts in the central study area, on either side of the KS-RLZ boundary, and as relict sillimanite within biotite porphyroblasts at the eastern boundary of the RLZ. The most recent metamorphic event, M_3 , overprints M_2 , and is characterized by S_5 -aligned biotite wrapping M_2 garnets, as well as staurolite-biotite-muscovite

assemblages at the eastern boundary of the RLZ. Metamorphic conditions calculated from geothermometry and Theriak-Domino will be presented along with a timeline of events.