

Piette-Lauziere N, Guilmette C, Bouvier A, Perrouty S, Pilote P, Gaillard N, Lypaczewski P, Linnen RL, Olivo GR, 2019, The timing and extent of prograde metamorphism in the Pontiac subprovince, Superior Craton: implications for Archean geodynamics and gold mineralization, Precambrian Research, 320, 111-136

The Pontiac Subprovince is located in the Superior Province, south of the Abitibi Subprovince. The metasedimentary rocks of the Pontiac Group are characterized by a Barrovian metamorphic gradient increasing from north to south from biotite- through garnet- to staurolite-zone conditions. The Pontiac Subprovince has been interpreted as an accretionary wedge or alternatively as an exotic terrane that was tectonically docked to the Abitibi Subprovince during Archean subduction. However, few studies have attempted to characterize its pressure-temperature-time path to test this hypothesis and little is known about the timing relationship between regional metamorphism and the gold mineralization. An E-W lepidoblastic ductile micaceous foliation defines the regional fabric related to the second episode of deformation. Garnet and staurolite porphyroblasts are interpreted to be late- to post-kinematic to the regional fabric. Locally, cordierite or andalusite porphyroblasts fully pseudomorphed by a polyminerally assemblage of muscovite, feldspar and quartz are wrapped by the main foliation indicating that a potential low pressure - high temperature metamorphism (M1) preceded the main episode of deformation and Barrovian metamorphism (M2). Pressure and temperature (P-T) forward thermodynamic modelling on a water-saturated pseudosection yielded peak conditions of 550–600 °C and 5–6 kbar during a prograde, clockwise P-T path for M2. Lu-Hf dating of garnet from three different locations within the staurolite zone yielded a weighted average age of 2657.5 ± 4.4 Ma (95% confidence level) that is inferred to be representative of these conditions. The age of garnet growth calls into question the previous tectonic interpretation of the Abitibi and Pontiac Subprovinces and is coherent with the new rafted ribbon continent model of Bédard (2018). Because the Canadian Malartic gold mineralization is older or synchronous with the garnet growth episode in the staurolite zone south of the ore body, this garnet age also provides an estimate of the minimum age of the mineralization event, previously dated at 2664 ± 11 Ma with Re-Os on molybdenite.

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