

Relative timing between the Canadian Malartic footprint and the regional metamorphism of the northeastern Pontiac subprovince, Abitibi, Québec

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The Pontiac subprovince is located south of the Cadillac Larder Lake Fault Zone in the Superior province. Whilst most gold deposits in the Abitibi subprovince occur north of or straddle this deformation zone, Canadian Malartic Gold is the only known deposit where the main body is hosted within the Pontiac subprovince. The Canadian Malartic deposit is spatially associated with intermediate intrusive rocks but shares many common genetic attributes with neighboring gold deposits, which are mainly hosted by volcanic rocks. Characterizing the relative timing between the mineralization and regional metamorphism is key to understanding the hydrothermal alteration footprint that surrounds the deposit. In the vicinity of the Canadian Malartic deposit, the regional metamorphism is characterized, from North to South, by biotite, garnet, and staurolite metamorphic zones. The regional fabric is defined by an E-W, NW-SE lepidoblastic ductile foliation in which garnet and staurolite porphyroblasts are interpreted to be syn- to late-kinematic. The gold mineralization of the Canadian Malartic deposit is located in the biotite zone at the greenschist metamorphic grade, where the absence of porphyroblasts hampers interpretations of the textural relationship between the mineralization, hydrothermal and metamorphic minerals. Nonetheless, macroscopic and thin section observations suggest that the main mineralizing event is associated with the main deformation event, which suggests that it was coeval or preceded porphyroblast growth during peak metamorphism. Lu-Hf dating of garnet from three outcrops south of the towns of Malartic and Val-d'Or yielded a consistent age of $\sim 2657 \pm 7$ Ma that is inferred to represent the growth of garnet on a prograde path close to metamorphic peak conditions. This age, compared to a previously published Re-Os age of ca. 2664 Ma on molybdenite hosted with mineralization in the main fabric, is consistent with our interpretation that the bulk of the mineralization is coeval with or preceded regional metamorphism. This contribution has a significant impact on our understanding of the Canadian Malartic deposit in two aspects: (1) regional metamorphism has likely overprinted the early hydrothermal halo, which is an important factor for the interpretation the mineralogical footprint of this deposit; and (2) Its relative timing with regional metamorphism is significantly different than for late-metamorphic orogenic Au deposits hosted in rocks at green schists metamorphic grade. CMIC-NSERC Exploration Footprints Network Contribution 120. MERN : contribution no. 8449-2016-2017-06