

Postmineralization Faults in the Beaufor Gold Deposit, Abitibi Greenstone Belt, Canada: Geometry, Origin, and Tectonic Implications for the Val-d'Or Mining District

ALAIN TREMBLAY†

INRS-Géoresources, Centre géoscientifique de Québec, Groupe Interuniversitaire de Recherche en Géodynamique et Analyse de Bassin, 880 Chemin, Ste-Foy, Québec, Canada G1V 4C7

Abstract

The Beaufor mine is a mesothermal vein-type gold deposit hosted by the Boulamaque pluton, a synvolcanic intrusion crosscutting Archean volcanic rocks of the Abitibi greenstone belt in the Val-d'Or mining district. The auriferous system is related to south-dipping reverse shear zones and consists of up to 2m-wide sheared and extensional sulfide-rich quartz veins. The auriferous veins system is crosscut by two generations of faults, east-west-trending, south-dipping (~60°) brittle-ductile reverse faults (e.g., the Dike 01-Central fault system) and subvertical to steeply north-dipping brittle faults (e.g., the Beaufor fault system). The Dike 01- Central fault system presents structural fabrics, kinematic, and hydrothermal characteristics similar to those of auriferous shear zones. Both are interpreted as master faults and secondary structures, respectively, with the Dike 01-Central fault system acting as a channelway for the updip draining of ore fluids that were mainly trapped in low-angle synthetic shear zones. Incremental deformation and progressive decrease of bulk fluid pressure led to strain localization and faulting of auriferous quartz veins by the Dike 01-Central fault system. The Beaufor fault system crosscuts all structures of the Beaufor deposit. It consists of a series of oblique-reverse, dextral faults that lack evidence for pervasive hydrothermal alteration. The main structure of that system is the east-west-trending, north-dipping Beaufor fault, which is associated with northeast- southwest-trending synthetic (i.e., West shear faults) and north-south-trending antithetic faults (i.e., Post-ore faults).

Fault zones of the Beaufor mine are reminiscent of large-scale tectonics in the Val-d'Or mining camp. Auriferous quartz-tourmaline vein deposits are commonly associated with east- west-trending high-angle reverse shear zones and hydrothermal events coeval with, or slightly postdating, peak metamorphism and regional deformation. Several fault zones of the Val-d'Or area preserve evidence for both reverse shearing and dextral strike-slip faulting. Structures recorded in the Beaufor mine suggest that reverse and dextral truncurrent faulting is genetically unrelated and probably resulted from sequential faulting rather than transpression.