

Metallogeny related to plutonism in the Northern Abitibi Belt

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The Northern Abitibi Belt consists of a narrow northern strip composed of two volcanic cycles and a terminal sedimentary phase, and a broad southern area consisting of a tholeiitic basalt plain with local felsic centres and a terminal sedimentary phase. Supracrustal rocks were folded isoclinally about E-W axes and traversed by E-W fault zones with both a vertical and a horizontal (dextral) movement component. The abundant felsic plutons formed at various structural levels and various periods, and had a profound influence on metallogenic patterns.

Subvolcanic plutons (2718 Ma) formed high-level cauldron subsidence complexes containing porphyry-type mineralization,

and generated epithermal systems in the overlying volcanic rocks. Porphyry associations with typical alteration patterns occur both as disseminated and vein ore bodies within breccia pipes in the intrusion, and epithermal veins occur within the overlying volcanic rocks. Block foundering and dyke injection associated with synvolcanic plutons created zones of weakness which played an important role in ground preparation for later mineralization. Some of these zones were exploited during regional deformation, resulting in the development of gold-bearing lodes.

These large structurally isotropic intrusions occurring within

anisotropic supracrustal rocks, induced many deviations in structural trends during regional tectonism. Syn- to late-tectonic intrusions (2695 Ma) exploited the structural break between the early intrusions and the supracrustal rocks. Monzodiorite, tonalite/granodiorite and granodiorite suites occur. These intrusions display amphibolite facies metamorphic aureoles in contrast to the prevalent greenschist facies. The close association with regional deformation and metamorphism implies the plutons were emplaced at the depth of regional metamorphism. These plutons may have contributed to the fluids related to the emplacement of lode-gold deposits controlled by regional ductile faults. Minor disseminated sulphides in the ultramafic and mafic early phases of some monzodiorite and tonalite plutons has never been

fully evaluated.

Late syntectonic and post-tectonic plutons are scattered throughout the belt, principally intruding the supracrustal rocks. The most abundant are porphyritic granodiorites occurring as clusters of small stocks. They appear to be cupolas derived from underlying granodiorite sheets, and most are late syntectonic in age. An episode of alkalic magmatism, represented by syenite stocks with associated carbonatite and lamprophyre dykes, occurs in linear array parallel to late northeast faults and appears to be youngest plutonic activity. Lode gold deposits occur in close spatial association with both the granodiorite and alkaline suite, although the source of the gold mineralization is still uncertain.