

Geology of the Lac Brune (33G07) and Baie Gavaudan region (33G10)

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Abstract

The Lac Brune (33G07) and Baie Gavaudan region (33G10), southeast of the La Grande-3 Reservoir, was mapped at a scale of 1/50,000 in 2009. The goal of this project is to establish regional geologic correlations and acquire new metallogenic knowledge for an area where the last geological surveys data back to 1975.

The mapped region is underlain by Archean rocks belonging to the La Grande Subprovince to the north and the Opinaca Subprovince to the south. The La Grande Subprovince comprises, from base to summit: tonalitic basement belonging to the Poste Le Moyne Pluton (2881 Ma) and the Langelier Complex (2788 to 3360 Ma), the volcano-sedimentary cover of the Guyer Group (2806 to 2820 Ma), and the new Brune (<2841 ±3 Ma) and Marbot (<2702 ±2 Ma) sedimentary formations. The contact between the basement and the Guyer Group volcano-sedimentary sequence is marked by regional shear zones. The Guyer Group comprises, from base to summit, tholeiitic basalt, felsic to intermediate tuff, iron formation, and komatiite. Mafic to ultramafic sills are associated with the Guyer basalts. The Brune Formation consists of a conglomerate unit in the centre of the Guyer Group. The Marbot Formation is defined in the transitional zone between Opinaca and La Grande. It represents a sequence of feldspathic wacke, conglomerate, and iron formation; this formation is separated from the Guyer Group and the tonalitic basement by a regional shear zone. Metamorphism in the La Grande Subprovince reached lower to middle amphibolite facies. Retrograde greenschist facies metamorphism is observed locally.

To the south, the Opinaca Subprovince is represented by the Laguiche Complex, mainly consisting of migmatized paragneiss containing up to 50% mobilizate. The enclaves and mobilizate are characterized by stromatic structures and contain garnet and (locally) orthopyroxene. The collective mineralogical assemblages of the metasedimentary rocks of the Laguiche Complex are indicative of granulitic facies metamorphism.

The Bezier Pluton (monzodiorite-granodiorite, 2674 ±12 Ma) and the Vieux Comptoir Granite (2618 ±2 Ma) intruded both subprovinces. Several Proterozoic dykes crosscut the Archean units. These dykes are assigned to the Mistassini, Matachewan and Senneterre swarms. Felsic, intermediate, mafic and ultramafic intrusions are also present in the region.

The boundary between the Opinaca and La Grande subprovinces is marked by a shear zone characterized by ubiquitous mylonites. A number of kinematic indicators reveal it to be a dextral strike-slip fault zone associated with north-to-south thrusting. The regional structural grain was the result of three superimposed phases of ductile deformation. The first, D1, affected the basement before the emplacement of the volcano-sedimentary cover. The second, D2, was a polyphase event affecting both basement and supracrustal rocks. This phase was responsible for the kilometre-scale folds and faults in the region. The third deformation phase (D3) resulted in N-S to NNW compression and a main direction of transport from north to south. This third phase was also responsible for the exhumation of the highly metamorphosed or migmatized parts of the Opinaca Subprovince.

The known showings and those discovered during our work demonstrate that the region contains many exploration targets with significant potential for gold and Ni-Cu deposits. The main occurrences of mineralization in the study region were observed in the volcano-sedimentary sequence of the Guyer Group in the form of gold-bearing iron formations, volcanogenic alteration zones (Cu-Zn-Ag-Au), and quartz-sulphide veins (Cu-Ag ± Au). Several examples of Ni-Cu ± PGE mineralization were also noted in komatiitic lavas and ultramafic sills. Two new showings, Cancet and Clothilde, are examples of rare metal mineralization related to pegmatites. The Cancet showing is represented by a white spodumene pegmatite injected in rocks belonging to the Guyer Group. The Clothilde showing contains molybdenite and silver mineralization in a white garnetiferous pegmatite.