

2014-06:

INTEGRATION AND SYNTHESIS PROJECT: PLUTONISM AND MINERALIZATION IN ABITIBI

The alkaline intrusions of the Abitibi: petrology, hydrothermal alteration, and Au mineralization

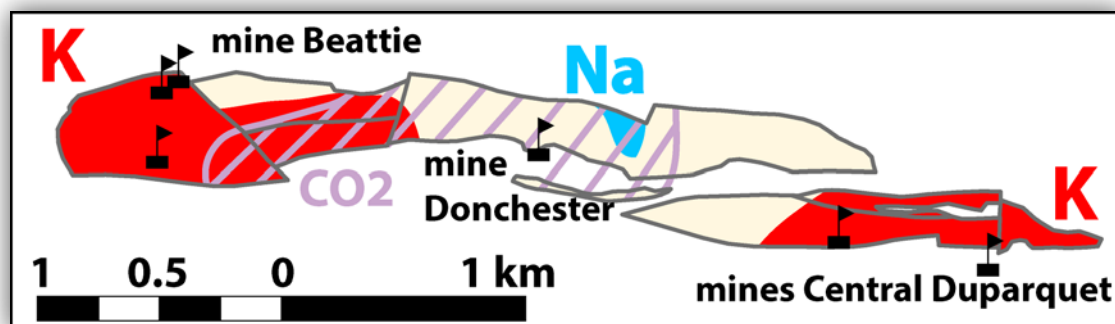
For many types of deposits, intrusions are important for the mineralizing process. With a focus on the gold deposits of the Abitibi, the roles of intrusions are as: 1) the thermal engine of the hydrothermal system (Au-VMS, for example); 2) the competent encasing of mineralized veins, quickly fractured by tectonic movements (cf. orogenic gold); 3) the possible source of heat, fluids, and metals for some deposits (cf. "syenite-related"-type of Robert (2001), for example).

The 2014-06 project aimed to integrate, compile, and question the eight previous CONSOREM projects involved in the theme of "intrusions and mineralization in the Abitibi". It led to establishing the state of science regarding intrusions in the Abitibi and compile the multiple ways in which intrusions are used in exploration. This compilation also highlighted the theme "Gold and alkaline intrusions," that was dealt with in detail within the framework of this project.

Alkaline intrusions are relatively more recent features in the evolution of the Abitibi region and are therefore spatially, sometimes structurally, and more rarely genetically related to gold mineralization. The recognition of this type of magma is therefore important for exploration and should be carried out with the aid of multielement (phased-array) charts.

As well, the chemistry of several intrusions was studied in the framework of this project to determine the chemical differences between mineralized and non-mineralized magmas. This investigation of the chemistry of alkaline intrusions indicates that there does not appear to be more fertile magmas than another (cf. source composition and special features of the partial melting and fractional crystallization). The difference concerns rather the nature and intensity of the alteration, and, in particular, K alteration that is mainly developed in the alkaline intrusions mineralized in Au.

Although the geochemical nature of these atypical magmas requires further studies, including the compilation of a greater number of examples, it seems that the gold deposits are associated with the most effective hydrothermal systems and not with individual alkaline magmas. Since the most favourable hydrothermal systems led to significant K alterations, it



is recommended to quantify and carefully map K alteration near alkaline intrusions in the Abitibi, using the various methods discussed in the framework of this study (cf. mass balance, Pearce Elements Ratio (PER) diagrams and tracers for trace elements).

Figure 1. Schematic representation of the main alterations of the Beattie intrusion. Potassium alteration was calculated using PER diagrams (Pearce, 1968) and the carbonation was estimated using the standard SV350 (Trépanier, 2011). The orebodies (localized according to the data of the SIGÉOM 2014) are also represented.

Project 2014-06: Summary sheet

Objectives	<ul style="list-style-type: none">➤ Review of prior CONSOREM projects having a focus on the theme of "Gold and intrusions in Abitibi".➤ Studying the chemistry of alkaline intrusions associated with gold deposits of the Abitibi.
Results and innovations	<ul style="list-style-type: none">➤ Review of past CONSOREM projects and proposing ideas to serve as the basis for future CONSOREM projects.➤ Study of the chemistry of nine mineralized (and non-mineralized) alkaline intrusions of the Abitibi.➤ Discussion of the available methods for quantifying the alteration in this specific type of rock and recommendation of using the PER diagram method.➤ Recommendation: In prospecting for gold in Abitibi, it is recommended to identify and better quantify K alteration in alkaline intrusions and their casings.