A Geochemical Model of Metal and Mineral Distributions in a Deeply Weathered Profile, Choco 6 Concession, Bolivar State, Venezuela

by

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A thesis submitted to the Faculty and Board of Trustees of the Colorado School of Mines in partial fulfillment of the requirements for the degree of Master of Science (Geology).

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ABSTRACT

The Choco 6 concession study area is located in the northern part of the Precambrian Guayana Shield, Bolivar State, Venezuela. The regional geology consists of an early Proterozoic greenstone belt (a volcano-sedimentary sequence) which was deformed during the Trans-Amazonian Orogeny (2.15 - 1.96 Ga). Gold mineralization is present in quartz-arsenopyrite vein structures in mafic metavolcanics and as a saprolite-lateritic regolith concentrations in up to 100 meters thick.

This study was mainly carried out in Cerro Azul, one of the four prospects found during earlier exploration stages. The Cerro Azul Area presents both complete and truncated weathering profiles.

The purpose of this study was to characterize the mineral and metal distributions within a deeply weathered regolith overlying primary Au mineralization. This characterization was based on data from X-ray diffraction, petrographic analysis and geochemistry of selected samples representing the complete weathering profile.

A geochemical model was developed to explain the different mineral and metal occurrences found in the regolith characterization was conducted. A 3 dimensional model has been developed for the Choco 6 concession. The full weathering profile is thought to have been generated in three stages: 1) iron crust formation, 2) manganese association supergene enrichment formation and 3) erosion of the pre-existent profile by lowering of the water table.

Stage I: Accumulation of the iron at and above the water table and formation of shallow regolith. Most of the elements that were contained initially in resistant minerals (hematite, ilmenite, goethite, kaolinite, and quartz) were concentrated in this horizon: Fe,

Cr, Cu, Mn, V, Sc, Al, Zr, and Ti. Gold distribution is also affected, but it retains its primary geochemical signature (As and K).

Stage II: The water table lowers, causing increased chemical weathering at deeper levels, thereby increasing the thickness of the regolith profile. The fluctuations of the water table leach the Mn, Ni, Y, Co, Cu, As, La, Zn, Zr, Cd, and Ba from the upper saprolite and deposit them in the lower saprolite forming the Mn association supergene enrichment. No enrichment of Au, Fe or Al is associated with the horizon of Mn association concentration.

Stage III: The water table is lowered further and the thickness of the regolith profile increases. Erosion of the preexistent profile becomes more intensive, exposing to the lower saprolite horizon, and in places reaching the Mn supergene enrichment horizon. The colluvium and alluvium are deposited in some areas of the lateritic landscape.

The last part of the study was an analysis of the soil geochemistry data. The superficial expression of the primary Au mineralization and its geochemical signature were obtained in the Cerro Azul area, by analysis of the spatial distribution of the soil geochemistry data. The most important results of the soil geochemical data interpretation are: 1) definition of a new geochemical pattern oriented N20W, which could control the gold mineralization in the area, 2) discovery that the gold mineralization geochemistry signature is partially conserved during the weathering process and could be used to locate the primary source, and 3) determination that the superficial expression of the Mn association can create false anomalies during the interpretation of geochemical data distributions.

The results obtained from this study will help to improve future exploration programs and to interpret the data collected during the first stages of exploration. Some recommendations are suggested, based on the improved understanding of the weathering profile. Reinterpretation of some drill sections should be done given the establishement of the limited mobility of gold and the identification of a new, second mineralization trend at N20W. Multi-element geochemical data proved useful in characterizing mineralization, supergene enrichment and variations in bedrock and are recommended for future programs.

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ACKNOWLEDGMENTS

Iwould like to acknoledge PROMINSUR for sponsoring my graduate studies at the Colorado School of Mines. I would also like to thank the members of PROMINSUR staff for their valuable cooperation.

My sincere gratitude to the members of my committe, Dr Greg Holden, Dr. Keith Turner and Dr. Graham Closs for their suggestions to improve the quality of this work. I especially want to thank Dr. Closs his guidance, friendship and numerous interesting discussions.

Thanks also to all my family for their moral support, particular my wife Sonia, son Sebástian and daugther Claudia.