

## **The Montagne d'Or auriferous volcanogenic massive sulphide deposit, French Guiana, South America: Towards a polyphase mineralization event.**

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In French Guiana, the “Montagne d’Or” gold deposit (5 Moz Au at 1.5 g/t), a property of the “Compagnie Minière Montagne d’Or”, is hosted by the northern branch of the Proterozoic Paramaca Greenstone Belt (PGB). The PGB is interpreted as the remnant of a volcanic island-arc sequence formed between 2.18 to 2.13 Ga during the Transamazonian orogeny. The sulphides deposit is hosted by a bimodal volcanic and volcanoclastic, south-facing sequence that is affected by a penetrative E-W striking and south-dipping regional foliation. The volcanic stratigraphy is dominated by calc-alkaline felsic lithologies to the west, interbedded and interdigitated with tholeiitic mafic rocks to the east. The mineralization consists of two main sulphide horizons, the Upper and Lower Favorable Zone (UFZ and LFZ), surrounded by two subsidiary zones known as the Footwall and the Hanging-Wall Zone (FWZ and HWZ). Three distinct facies characterize the sulphide mineralization, (1) stratiform disseminations, (2) stockwork-veinlets, and (3) structurally-transposed layers of semi-massive sulphides. The Au mineralization is associated with pyrite, pyrrhotite and chalcopyrite with minor sphalerite, magnetite and arsenopyrite within chlorite-sericite-rich alteration halos. Gold-copper-bismuth values show typical positive correlations throughout the deposit. Metal distribution is, however, variable; the UFZ is Cu-rich and hosts two Au-rich zones whereas the LFZ shows Zn enrichment. The westernmost parts of both the UFZ and LFZ orebodies have positive Sn-Ag anomalies, coexisting with Sb-Mo anomalies in the UFZ and As anomalies in the LFZ. These anomalies are consistent with a syn-volcanic magmatic input related to the granodiorite facies. Also, the eastern part of the UFZ has higher Te-Bi values which seems to correspond to the felsic-mafic transition in hosting rocks, whereas the FWZ is characterized by Zn-Pb values. These chemo-stratigraphic variations suggest a two-step replacement process; (1) a primary low-temperature Zn-Pb rich hydrothermal fluid input within the LFZ-FWZ, and (2) the superimposition of secondary high-temperature fluids impregnating the upper part of the sequence forming the Cu-Au rich UFZ-HWZ orebodies. The last mineralization event is interpreted to be the result of sulphide remobilization by metamorphism and deformation, as suggested by the occurrence of ore textures such as piercement, *durchbewegung*, drag folds and polygonal sulphides recrystallization. Quartz-chlorite-carbonate-sulphides veins with Cu±Au±Bi±Te±Sb±As mineralization sometimes occur in intrusive rocks crosscutting the ore. This vein-type mineralization is attributed to *in situ* remobilization rather than external additions, and it suggests that among the three types of mineralization events, only two were auriferous in the Montagne d’Or deposit.