Polyphased gold mineralization in the Siguiri district, Guinea*

*Corresponding author: Erwann O. Lebrun, Centre for Exploration Targeting, erwann.lebrun@gmail.com

Co-authors:
Nicolas Thébaud, Centre for Exploration Targeting, nicolas.thebaud@uwa.edu.au
John Miller, Centre for Exploration Targeting, john.miller@uwa.edu.au
Campbell T. McCuaig, Centre for Exploration Targeting, campbell.mccuaig@uwa.edu.au

The Siguiri gold district hosted in the Siguiri Basin of north-eastern Guinea, is one of the first gold producers of west Africa. This world-class orogenic gold district spreads over 539 km² of Birimian metasedimentary rocks and is covered with extensive lateritic profile and transported material. In this outcrop poor district, our ability to target and explore for mineralization strongly relies on our capacity to map out related ore stains in and around gold bearing lodes. The aim of this study is to characterize the mineral paragenetic sequence and geochemical footprint of orogenic gold mineralization in the district in order to better assist targeting of similar orogenic gold systems in the Siguiri Basin.

Using the newly defined structural framework to mineralization, samples were carefully selected and collected from various open casts. Petrographic studies and whole-rock geochemistry were conducted across multiple high-grade zones displaying grades up to 117 g/t. Petrological descriptions were completed by SEM scanning and XRD analyses to constrain the paragenesis and relative timing of mineralization in the district. Whole-rock geochemistry was also complemented with density measurement in order to do mass balance calculations using modified isocon diagrams.

The results of this study show that the Siguiri gold district resulted from a complex hydrothermal history involving two distinct stages of mineralization. The first mineralization event is characterized by intense carbonate formation, sericitization, and the development of ankerite-pyrite brecciated veins along cross-structures. The second mineralization event follows a stage of barren quartz veining that mark the onset of the main mineralization event. This second mineralization stage is characterized by banded quartz-carbonate veins associated with arsenopyrite halos. Visible free gold can be sometimes found in the veins.

Whole-rock geochemistry conducted across primary ore shoots displays elemental gains and losses related to these mineralization episodes. These geochemical sections indicate enrichments in Au, As, Bi, Co, Mo, Na₂O, Pb, SiO₂, SO₃, Sr, W and to some extent Cu close to the shoots. Losses in Cs, K₂O, Li, MgO, MnO, P₂O₅, Rb, Tl, V, Zn and to some extent BaO and CaO are also associated with high grade ore shoots. These results are in agreement with the mineralogy as well as with density measurements and XRD data.

Collectively these results indicate that gold mineralization in the Siguiri district compares well with other vein hosted orogenic-type gold deposits in the Birimian Craton. Through the definition of the gold related stain, the present study holds significant implications for the future of exploration strategies in the Siguiri Basin.