Structural controls of fluid flow and 3D geometry of high-grade oreshoots at Namoya Gold Mine, Kivu Region, DRC

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Background

Namoya Mine consists of several gold deposits and prospects in the south-western extent of the Twangiza-Namoya Gold Belt, situated within the Kivu-Maniema region of the Mesoproterozoic Kibaran Mobile Belt, Eastern Democratic Republic of Congo (DRC). The Namoya Mine area consists of NW-trending, steeply-dipping Mesoproterozoic tectonostratigraphic units of low grade metamorphosed, (up to) greenschist facies, meta-sedimentary and meta-volcaniclastic/volcanic units that exhibit variable strain and fabric/schistosity development within a broad "damaged" or shear zone corridor.

Methodology

Detailed structural and kinematic mapping and analysis of Namoya Mine's open pit operations was integrated with modern implicit modelling workflows and software (Leapfrog) to constrain the orebody geometries and controls in 3D space.

Key Results

On a local scale, auriferous deposits spatially coincide with the clockwise deflection or rotation within the encompassing WNW- to NW-trending, dextral shear zone corridor. On a deposit-scale, there are spatial correlations between (1) auriferous mineralized zones; (2) chlorite-sericite-carbonate±pyrite hydrothermal alteration; (3) the development of quartz, quartz-carbonate and quartz-carbonate±tourmaline veins; (4) heterogenous strain partitioning and shearing localized along contacts of contrasting/variable competency under greenschist facies metamorphic conditions and (5) prominent clockwise deflections within the host tectonostratigraphy and controlling S2 mylonitic shear foliation.

Main conclusions drawn from these results

Field observations are consistent with brittle-ductile S2 shear development and associated fluid flow centered within or along incompetent sericite schist units adjacent to relatively competent meta-volcanic units. A rheological/competency contrast facilitates strain incompatibility and heterogenous strain partitioning along these contacts during continued deformation. The clockwise rotation along these contacts and S2 shears, coupled with dextral-transpressive kinematics, result in releasing bend geometries within the host tectonostratigraphy. This created low mean stress conduits along the flexures of the releasing bends that enabled the development of linear conduits, geometrically-similar to dilational jogs, of increased permeability, preferential fluid flow and increased fluid flux during deformation and fluid pressure cycling. Individual dilational jogs exhibit moderately to well-developed steeply-plunging prolate ore shoot geometries that internally consist of interconnected parallel to sub-parallel arrays of auriferous mineralized lenses. The spatial continuity of mineralized lenses is observed to correlate with the degree of clockwise deflection of the host tectonostratigraphy.