Structural and Lithological Overview of K.O.V. Mine, DRC: A Polygenetic Mélange from an Evolving Lufilian Arc Foreland Basin

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The Kolwezi area of the Democratic Republic of the Congo, is host to world-class stratabound Cu (±Co, Ni, U, Pb, Zn) mineralisation. This mineralization is hosted in extremely large fragments of coherent lower Roan Group units. Long-debated genetic models for the development of this deposit include: 1) tectonic mélange (friction breccias), 2) halokinesis or salt tectonics and 3) sedimentary mélange. Historical data at K.O.V. Mine, spanning 70 years and comprising diamond and reverse-circulation drilling, structural and lithological face mapping, downhole tele-viewer data and macro-structural logging, has been re-analysed and used in the construction of a fully-constrained 3D implicit model of structures and lithologies, which sheds new light on the genesis of this world-class deposit.

Several features, at a variety of scales, provide evidence of its genesis: 1) structures inherited from residence time within the fold-and-thrust belt of the hinterland; 2) block-in-matrix fabrics; 3) soft-sediment deformation structures; 4) matrix-supported, polymictic conglomerates; 5) discordant and unconformable sedimentary relationships; 6) occurrence of multiple sub-types of R.A.T; 7) different styles of shearing at and away from the base of fragments; 8) large-scale juxtaposition of fragments, possibly complicated by dewatering of the pile; 9) variable geometries, sizes and attitudes of fragments and 10) KOV's unique structural setting in the foreland of the main arc.

This study concludes that gravity-driven mass-transport processes, concomitant with the development of a polygenetic sedimentary mélange, occurred within a foreland basin, a portion of which is preserved at Kolwezi, during Pan African orogenesis (ca. 550 Ma). Variable degrees of post-emplacement modification of the primary sedimentary mélange resulted in predominantly brittle folding, low-grade shearing of fragments during continued approximately N-S-directed orogenesis, tightening of the "Kolwezi Klippe" and impingement of fragments against one another accompanied by dewatering of the pile and remobilization of metals.

Figure – *Rounded, slumped fragment at the base of the Ore Zone within R.A.T, Lilas, indicating unconsolidated nature of the underlying host R.A.T. sequence at the time of incursion or arrivalof the overlying fragments, resulting in soft-sediment deformation.*