Understanding of Ground Gravity Responses Over the Kiala Deposit, Western Foreland, Democratic Republic of Congo

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The Western Foreland (WF) of the Democratic Republic of Congo is host to the Kamoa-Kakula copper complex, and the Makoko and Kiala Deposits. Extensive airborne geophysics has been instrumental in developing the geological models used for exploration on the WF which led to the more recent Makoko and Kiala discoveries. Airborne gravity was flown in conjunction with magnetics and provided clear gravity low anomalies over the Kakula and Kamoa domes defined by Roan Group clastic rocks in the core; however, for smaller features the resolution was too coarse. For this reason, an extensive program of ground gravity was carried out to improve resolution.

At the Kiala deposit, mineralisation is hosted mainly in siltstones deposited in sub-grabens which accommodate thicker sequences of Nguba stratigraphy, dominated by diamictite. Ground gravity collected in the area highlighted two distinct north-south linear features that were assumed to be associated with higher density ferricrete/laterite within the lower density saprolite. Forward modelling of the higher resolution ground gravity data was carried out using the density of the rock types generated by routine measurement on core, to determine the cause of these anomalies. It was determined that the anomalies were not associated with ferricrete/laterite, but rather a thicker Nguba sediment sequence and mafic intrusive.

It is difficult to distinguish structures from the airborne magnetics over Kiala due to low magnetic susceptibilities. The ground gravity results highlighted low gravity responses in the same orientation as the sub-grabens. These correlated to the location of faults and lower density Nguba sediments adjacent to the faults, potentially caused by increased weathering along structures or associated alteration of faults. Thus, the ground gravity proved useful for delineating structures where the magnetic survey was ambiguous.