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Sequence Stratigraphic Correlation and Depositional Environment Mapping in the Katangan Basin of Central Africa: Implications for Mineral Exploration

Martin Purkiss[1], Michael C. Daly[2]
1. Ivanhoe Mines, Sandton, South Africa, 2. University of Oxford, Oxford, United Kingdom

The Neoproterozoic Katangan basin of Central Africa contains the Katangan Supergroup, recording ~300 Myr of depositional history spanning the Tonian, Cryogenian and Ediacaran. The basin hosts the Central African Copperbelt: the world's largest sediment-hosted copper province.

Lithostratigraphic schemes are abundant across the Katangan basin. The value of lithostratigraphy is limited, however, on account of diachroneity being imparted by correlating on the basis of lithology, rather than time. A sequence-driven stratigraphic framework can alleviate this, providing predictive capability for the distribution of mineral system components in underexplored parts of a basin.

Proposed here is a revision of the Katangan Supergroup based on sequence stratigraphy, and its division into four 2nd-3rd-order sequences. The sequence stratigraphic correlation is based on detailed sedimentological logging of Katangan stratigraphy across the basin, supplemented by data from literature. It encompasses predominantly 2nd-3rd-order cycles and follows a modified version of depositional sequence model III. The sequence stratigraphic correlation is incorporated into a new structural interpretation of the basin to generate depositional environment maps for each major stage of the basin's tectonostratigraphic evolution.

Mapping of gross depositional environments constrains the distribution of metal sources, reductants, fluid pathways, and evaporites in space and time, relating them to key periods in the Katangan basin's history.

The revised stratigraphic scheme allows for more reliable correlations to be made across the basin where lithologies are repeated or too ambiguous to be correlated lithostratigraphically (e.g. Grand and Petit Conglomerat). Mineralised horizons such as the 'ore shale' are shown to likely be diachronous. Deposition of metal sources is predominantly restricted to periods of rifting (Lower Roan, Mwashia Groups), with reductant and evaporite deposition tending to coincide with post-rift thermal subsidence (Upper Roan, Nguba Groups).

The proposed stratigraphic scheme provides an improved framework to better understand the Katangan basin's evolution and exceptional metal endowment.