

Application of Facies Analysis and Sequence Stratigraphy in the Zambian Copperbelt and Implications for the Tectonostratigraphic Evolution Katangan Basin

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The Neoproterozoic Katangan basin hosts the world's largest sediment-hosted copper province, the Central African Copperbelt. A key to understanding sediment-hosted mineral deposits and the ability to predict their presence in unexplored stratigraphy is an understanding of the dynamic stratigraphic context in which the sediments were deposited. Here we provide a sequence stratigraphic model for the Zambian Copperbelt based on a unified facies scheme, with significant implications for Katangan stratigraphy, hydrothermal pathways, mineral distribution, and tectonostratigraphic evolution.

The proposed facies scheme is based on detailed sedimentological logging of over 10 km of continuous diamond drill core. It provides the first complete facies framework for Katangan stratigraphy in the Zambian Copperbelt, which has allowed for the stratigraphic evolution of the basin to be constrained quantitatively. Clear sedimentological and stratigraphic evidence is provided for two phases of extension and subsequent thermal subsidence.

The proposed sequence stratigraphic model is based on an uncertainty-sensitive, rule-based workflow. This generates a relative chronological framework for a basin with a paucity of firm chronological constraints. It highlights the variety of viable stratigraphic frameworks for the Zambian Copperbelt by considering both accommodation space and sediment supply. The mineralised mudstone unit, locally termed "ore shale," appears to have been deposited in a variety of depositional environments, ranging from turbiditic to intertidal. It may not represent a single flooding surface, but rather local sediment starvation as a result of basin-wide aridification. Evidence is also indicative of the ore shale being highly diachronous, and possibly discontinuous along-strike.

These and other observations show our model provides a basis for increasing our understanding of the Katangan basin's facies distribution and stratigraphic architecture and their implications for mineralisation.