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BRITTLE FAULTING, TECTONIC STRESS AND MINERALIZATIONS IN THE LUFILIAN ARC AND FORELAND (DRC)

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Abundant brittle deformation structures can be found in the Neoproterozoic Katangan sedimentary series in the Lufilian Arc and its Kundelungu foreland. These sedimentary series, typically known for their high-grade host copper-cobalt ores, are folded, brecciated and faulted during the Pan-African orogeny (550 - 520 Ma, with its peak at ~ 530 Ma). By performing a regional paleostress reconstruction, we intend to highlight the late- to post-orogenic tectonic evolution of this belt and its possible effects on the reshaping and emplacement of mineral deposits by Co-Cu-sulphide remobilization.

Fault-slip data have been sampled in open pit mines and occasional outcrops at different sites across the Lufilian Arc and its foreland. We apply a paleostress reconstruction (using the Tensor software) based on fault kinematics and field observations in order to comprehend the fracture types and their chronology, the fault behavior and mineralization associated.

Our results allow to identify several brittle tectonic stages in the Lufilian Arc and its foreland. They have been classified as syn-, late and post-orogenic relative to the main stage of the Pan-African deformation. They are all characterized by their own stress state, in terms of horizontal stress orientation and stress regime. They can by differentiated by their typical fault-kinematics, reactivation features, associated cataclastic texture and their relation with the mineralization. The oldest brittle event, which has been recorded in open mines at different locations of the Arc, is compressional. It is interpreted as syn-orogenic and has no remobilizing effect on the Co-Cu sulfides. It was followed by a multiphase strike-slip to extension faulting, causing remobilization of Co-Cu-sulphide mineralization trough remobilization. Dip-slip sub-vertical fractures sometimes mineralized and mainly reactivating bedding planes are typically found in the central part of the Arc. They occur in both limbs of the major fold structures, as well as within the tectonic breccias that commonly occupy the core of the folds, both suggesting a post-folding brittle extension faulting event.

The brittle structural data set records different stress solutions of regional importance, leading to a subdivision of the Lufilian Arc into periods of different fracturing behavior, reflecting successively the Pan-African orogeny, a later compression event of possible Late Paleozoic-Early Mesozoic age, followed by Late Mesozoic to Cenozoic rift-related extension. The youngest brittle structure generation complies with a stress field reconstruction that is compatible with recent local earthquake focal mechanisms.