Deformation Zone Architecture, Reactivation and Mineralisation Processes in the Eastern Succession of the Mount Isa Inlier

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1. Setting the Scene for the Investigation

The Eastern Succession of the Mount Isa Inlier is a highly endowed base metal province with a long and complex history of metamorphism and deformation. Recent investigations have spatially linked major crustal structures in the Eastern Succession with the deposition of large orebodies. This investigation, based on the history of major fault activity and its effect on the channeling and focusing of large volumes of fluid, aims to further explore this link and potentially realign current methods of exploration.

2. The Study Area

3. Irregular Fault Geometry and Mineralisation

4. Structurally Related Mineralisation

Recent structural studies, such as fractal analysis on deposit and prospect distribution (Blenkinsop and Oliver 2003) and mine-based structural analysis (Roache, 2004), have produced evidence for a strong spatial link between major Eastern Succession architecture and deposit geometry and locality. For example, as illustrated below and to the right, the Cannington orebody has recently been reinterpreted (Roache, 2004) as being a shear zone-hosted deposit, related to retrograde metasomatism occurring post-peak metamorphism. The deposit has been displaced approximately 300m sinistral by the late retrograde, northwest trending Tropic Fault (right), which is also considered to be significant in the introduction of silver into the orebody (Blenkinsop, 1998; Chapman and Williams, 1998; from Roache, 2004). Further related structural investigation will provide a stronger link between structure traps and embayments, which will redirect exploration to preferentially target structural traps over lithological or alteration suite associations.

5. Major Fault History

Major faults of the Eastern Succession, such as the Cloncurry Fault pictured below, show clear evidence of having a long and complex history of movement. The activity of long-lived crustal intrusions, such as the Cloncurry Fault, are inferred to play a fundamental part in the channeling and focusing of large volumes of fluids during the most significant period of mineralisation in the Eastern Succession. The existence of separate fault generations, and their subsequent interaction, creates uncertainty as to which major crustal fluid pathways were active at what time, and what fault interactions created optimal mineralisation environments. Mechanical modeling of fluid pathways through time is only possible provided the major structural architecture of the study area is known. Accurate whole Eastern Succession mechanical modeling in the future is dependent on the current knowledge of the structural history of the Eastern Succession.

6. Project Significance

Recent investigation has placed a substantial emphasis on the importance of understanding mineralised fluid flow processes which are controlled by deformation. This, combined with the current interest in using whole-Eastern Succession mechanical modeling as a mineral location predictor, highlights the importance of an investigation into the history of the architecture of the Eastern Succession and its relationship to the current location of undiscovered mineral deposits.