

Mineral systems modelling of Zn-Pb and Cu-Co mineralisation within the Mount Isa Inlier, Queensland

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The Mount Isa Inlier is one of the world's best-endowed base and precious metal provinces, and contains multiple examples of world-class Sediment-Hosted Base Metal and Iron Oxide Copper-Gold deposits. Deposits of each type show significant variations in timing, metal endowment, structural controls, chemistry, and mineralogy, attesting to the importance of the understanding of critical process factors in their formation as opposed to the rigid application of empirical models.

The Mount Isa region has been an active mining district since the late 1800's, with most of the early exploration success attributable to prospecting, though there were also some discoveries related to geochemical surveys. The period from 1986 to 1993 marked a resurgence in discovery, with a series of exploration successes attributable to geochemical surveying and drilling of geophysical targets under shallow cover.

The region has since been the subject of nearly 25 years of intensive geoscientific study by state and federal surveys, universities, and government research organisations under the banner of numerous cooperative research centres, government exploration initiatives, collaborative industry projects, and other public and industry-funded research projects. The result of this work is that knowledge is well-advanced regarding the key processes leading to the formation of the various styles of mineralisation in the region; though controversies and disagreements remain, such as timing of Zn-Pb-Ag mineralisation relative to sedimentation and discordant Cu-Co mineralisation, and the role of magmatic fluids in the formation of IOCG deposits.

A more pressing concern is that these advances in understanding have not resulted in new discoveries in the region, despite the fact that a large proportion of the Mount Isa Inlier is under cover and has been barely explored. The key challenge for mineral systems modelling in the Mount Isa region is to develop an understanding of what needs to be done differently in order to identify covered or blind targets, and to recognise their broader footprints in geophysical surveys, geochemical data and early stage drilling. As the major mines in the region become more mature, the need to convert the value of mineral systems modelling into products and knowledge which can be easily used by exploration companies has become increasingly critical.