Identifying mineralization patterns using auto-correlation and weights of evidence.

1. Introduction

Australia's Mount Isa Inlier in NW Queensland contains major copper+/-gold and Pd-Zn-Ag resources, making it one of the world's premier mineral provinces.

Understanding the structural controls on regional-scale ore localisation is an important aid to mineral exploration.

This poster aims to define the regional structural controls on ore localisation in the eastern Mt Isa Inlier using a 3 phase analysis:

1. Literature Review:
Deposit-scale structural controls

2. Weights of Evidence:
spatial associations of mineral deposits

3: Auto-correlation:
analysis of mineralisation trends

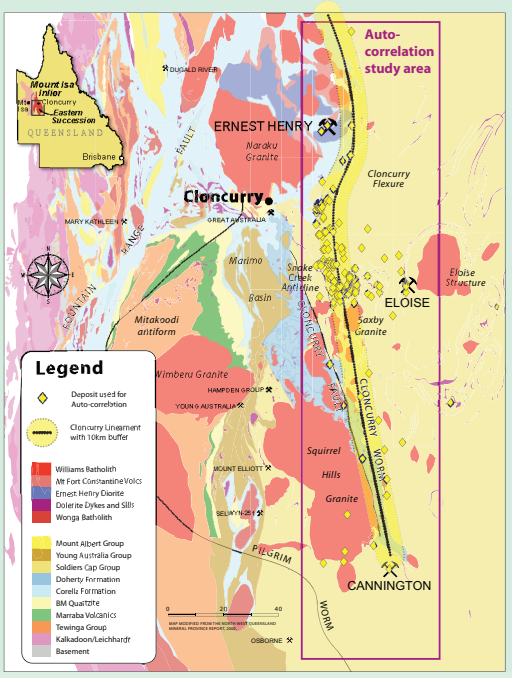

Figure 1: The geology of the Mt Isa Eastern Succession showing; study area, mineral deposits and the Cloncurry Worm (see panel 2). A weights of evidence study shows that 65% of deposits in the study area occur within 8km of the CW.

2. Background

1. The Isan Orogeny which occurred from ~1.6-1.5 Ga left a record of complex deformation and a range of mineral deposits. It consists of three major episodes; D1: 1610 Ma N-S thrusting, D2: 1545 Ma E-W folding, D3: 1510 Ma E-W folding/brecciation.

2.Hatton and Davidson, (2004) suggest that ironstones were emplaced toward the end of sediment deposition at 1650 Ma. Some authors suggest primary mineralisation at Cannington occurred at 1590 Ma. Several deposits seem to have formed at ~1530 Ma and some are thought to have formed at ~1500Ma

3. Carter (1961) and Laing (1998) propose that N and NW faults host both Cu-Au and Pb-Zn-Ag deposits while "North-east faults are generally barren." Carter (1961) also suggests that NE+NW & NNW+NNE faults are two conjugate fault sets that formed as a result of two successive stages of East-West shortening.

3. A prospectivity analysis by Mustard et al. (2004) identifies the Doherty Formation-Soldiers Cap Group contact (a NNW tectonic feature) and NE trending strike-slip faults to be highly prospective to Cu-Au mineralization. These structures are interpreted to be two main components of a major geophysical lineament referred to here as the Cloncurry Worm (CW).

3. Structural controls / settings - deposit scale

Structural information can be found for 26 deposits in the study area (see table). Structural controls are sourced directly from the references (see figure 3) or inferred from 1:100k geological mapping where information is inadequate.

Structurally, there are three main types of deposit and several unique / more complex deposits.

1. North trending, iron formation-associated deposits that are Pb-Zn-Ag rich.

2. North trending, iron formation-associated deposits that are Cu-Au rich.

3. Copper or gold dominated deposits that formed along, or at the intersection of, syn-post orogenic, variably orientated, faults by remobilization of copper and gold.

NB: The three largest deposits (e.g., Cannington, Eloise, Ernest Henry) have more complex fault geometries than smaller deposits.

DEPOSIT NAME	SIZE	DEPOSIT TYPE	LODE ORIENTATION / STRUCTURAL CONTROL	REFERENCE
Ag-Pb-Zn +/- Cu Deposits				
Cannington	Giant	Ag Pb Zn	N-NNE - BIF	Chapman & Williams 1998; Walters and Bailey, 1998.
Pegmont	Medium	Pb Zn Ag	NE - BIF	Blake et al,1983, Vaughan & Stanton, 1986
Cowie	Small	Zn Pb Ag	NNW - BIF	Blake et al,1983
Maramungee	Small	Zn Pb Cu	N - BIF	Williams and Heinman,1993
Fairmile	Very Small	Ag Pb Zn Cu	N- BIF	Donchak et al, 1983
Maronan	Very Small	Pb Ag Cu Au	N - BIF	DeJong, 1995 (PhD Thesis)
Black Rock	Very Small	Pb Zn Cu Ag	N - BIF	Blake et al,1983
Dingo	Very Small	Zn Cu Au Ag	N - BIF	Nisbert & Joyce, 1980 (in Blake et al, 1983)
Cu-Au Deposits (brecciated)				
Ernest Henry	Large	Cu Au	Dilational jog in N-trending fault	Cleverley & Oliver, 2005, Mark et al, 1999,
Cu-Au Deposits hosted by iron formations in north trending faults				
Eloise	Medium	Cu Au Ag	North trending BIF	Baker & Laing, 1998, Baker et al, 2001
Mount Norna	Small	Cu Ag Au	North trending BIF	Hatton & Davidson, 2004
Monakoff	Small	Cu Au Ag Pb	North trending BIF	Hatton & Davidson, 2004
Weatherley	Very Small	Cu Au	North trending BIF	Hatton & Davidson, 2004
Cu-Au Deposits (remobilization along late / minor faults)				
Great Australia	Small	Cu Au	N / NE Fault Intersection	Carter, 1961; Cannell & Davidson, 1998
Gilded Rose	Small	Au	NNW / NE Fault Intersection	Oliver et al 2004
Barnes Shaft	Very	Cu	NNW / NE Fault Intersection	Blake et al,1983
Landsborough	Very Small	Cu	NE Fault	Donchak et al, 1983
Louise	Very Small	Cu	NE Fault	Donchak et al, 1983
Mount Arthur	Very Small	Cu	NNW / NE Fault Intersection	Blake et al,1983
Mount Kalkadoon	Very Small	Cu	ESE Fault	Donchak et al, 1983
White Cliffs	Very Small	Cu Au	Shear Zone	Blake et al,1983
Mount Carol	Very Small	Cu Sio	not observed	Blake et al,1983

predictive mineral discovery
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