Identifying mineralization patterns using auto-correlation: and weights of evidence... (pt 2)

4. Auto-correlation - regional scale

Auto-correlation is used to delineate patterns of mineral deposit distribution by defining the spatial relationship of each deposit to all others. MINOCC (2002) data was sorted into Pb-Zn-Ag, Cu, Cu-Au, Au-Cu and Au deposit types. Patterns of deposit locations are revealed by plotting the ends of vectors drawn from each deposit in turn at the centre of the plot to every other deposit. The resultant XY plots and rose diagrams are shown here ->

1. Cu-Au deposits show strong N-NNW trends as well as ~NE and SE trends.

2. Cu deposits have strong NNW and N-S trends

3. Pb-Zn-Ag deposits show strong N and NNE trends

4. Au+/-Cu deposits show 5 different trends: N-S, NE, ENE, ESE, SE; these correlate with a variety of late faults.

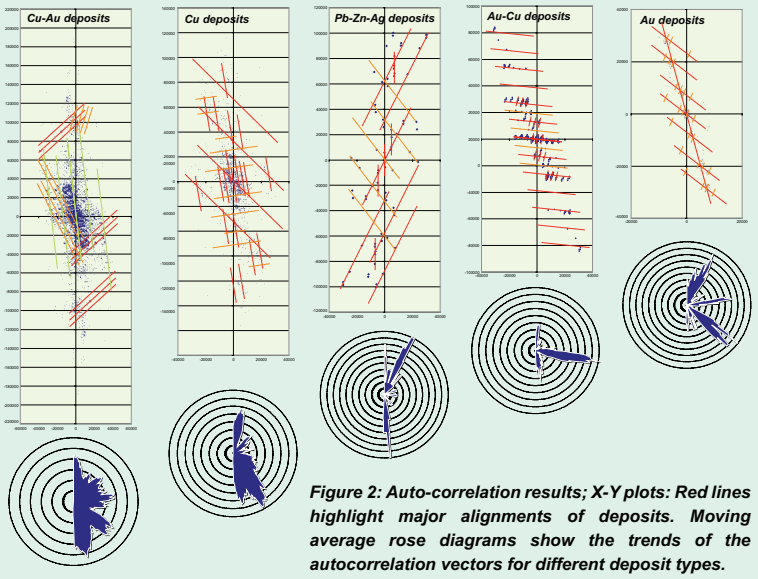


Figure 2: Auto-correlation results; X-Y plots: Red lines highlight major alignments of deposits. Moving average rose diagrams show the trends of the autocorrelation vectors for different deposit types.

5. Weights of Evidence

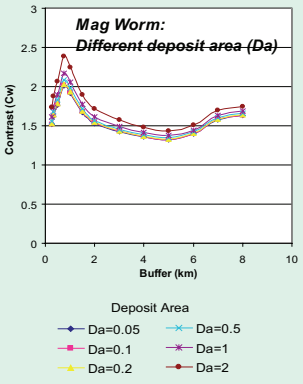
"Weights of evidence" is the degree of spatial association between deposits and a geological variable (e.g. buffer around fault). It is expressed by the Contrast (Cw); the natural logarithm of the ratio of the odds of a deposit given the presence of the geological feature to the odds of a deposit in the area without the feature.

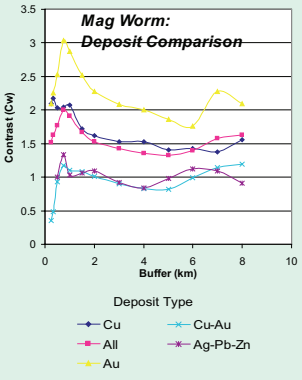
Cw > 0.5 indicates a significant spatial association, thus there is a strong correlation between mineralisation and the Cloncurry worm.

Au and Cu deposit types have a stronger correlation with the worm than Ag-Pb-Zn deposits . This contrast could be explained by a 2-phase mineralisation history where:

1. Large, low grade, Ag-Pb-Zn & Cu-Au primary deposits formed first. The structural relationship of these deposits to the Cloncurry worm is inconsistent, however Cannigton (the largest of these deposits) sits directly on the worm.

2. Smaller, higher grade Au and Cu deposits formed on minor faults related to reactivation and a second phase of fluid flow along the Cloncurry worm. These fluids may have been basin fluids related to late syn-post-Isan extension.





6. Conclusions

- Weights of Evidence analysis indicates that mineral deposits in the study area have a strong correlation with the Cloncurry worm.
  - Cu and Au deposits have a stronger spatial association than Ag-Pb-Zn and Cu-Au deposits.
- Auto-correlation analysis shows N-NNW Cu-Au trends and N & NNE Pb-Zn-Ag trends, which correspond to north trending Iron formation deposits in table 1. There are Cu-Au rich and Pb-Zn rich end members.
  - These trends are generally bedding parrallel and probably reflect the stratiform nature of these deposits. It is also possible that the ironstones have formed in N-trending normal / dip-slip faults (e.g., the N-S Levuka shear zone).
- Au+/-Cu deposits have moderate NE, ENE, ESE, SE trends and have a strong spatial association with the Cloncurry worm. These deposits reflect secondary mineralisation along variably oriented late syn-post orogenic faults.
- Cu deposits have a strong NNW trend and have a strong spatial association with the Cloncurry worm in the weights of Evidence analysis, and thus appear to be structurally controlled by the Cloncurry Worm

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