predictive mineral discovery
COOPERATIVE RESEARCH CENTRE

A1 Project: Simple tests of spatial relationships between architecture and gold mineralisation in the Yilgarn Craton, WA

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Summary

Several simple tests show surprising and interesting spatial relations between gold mineralisation and various aspects of faults (length, bends, jogs), gravity worms, and regional-scale fold axes.

Introduction

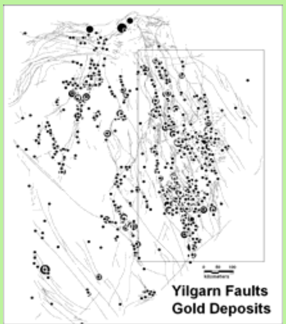
Four basic tests were designed to quantify spatial relationships over the entire Yilgarn Craton. Data comprise mineral deposits from MINLOC and OZMIN (GA); edited and concatenated faults from GSWA.

Synthesis of mineralisation intensity of tested factors

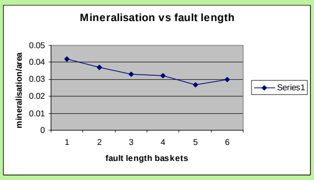
Factor	Mineralisation Intensity	
	mineralisation_rank	mineralisation_prod'n
average Yilgarn	0.01	5
long gravity worms	0.05	34
bends; all faults	0.10	173
jogs; all faults	0.14	340
fault major >100km	0.04	18
synclines	0.14	44
anticlines	0.26	67
intersection anticline, major fault	0.45	430
intersection syncline, major fault	0.23	120
small faults near major faults	0.09	130
small faults away from major faults	0.08	30
intersection fault, bend	0.08	30
intersection of fault, dome and bend	0.13	40

Results

Test 1: Mineralisation and fault length



Map of faults and mineral deposit, entire Yilgarn



Graph of mineralisation within intersection of buffers around anticlinal axes, and buffers around major (>100km length) faults. Anticlinal buffers 1=5km, 2=10km, etc.

Mineralisation seems slightly more related to small faults than large faults. This contradicts results from other tests (eg gravity worms). An explanation might lie in the mineralisation model.

S. Cox suggests mineralisation is related to aftershocks on small faults adjacent to large faults.

To test this, large faults (>100 km length were buffered at 2 km and mineralisation *within* and *without* the buffers compared.

There are similar densities of occurrences *within* and *without*; however there is significantly more Au production within 2 km of large faults.

Au occurs preferentially in small faults adjacent to large faults.

Test 2: Mineralisation and gravity worms

Gravity worms as imaged concatenated lines. Various length baskets defined, buffered and mineralisation within buffers summed, divided by area of buffer. Zwt_max factor, reflecting depth of worm, applied to worm segments and buffered; mineralisation within buffers summed, divided by area of buffer.

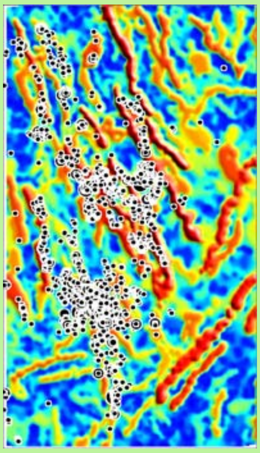
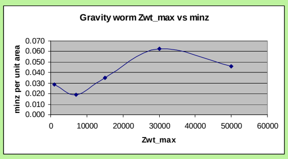
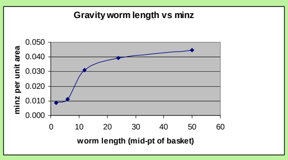


Image of processed gravity worms of eastern Yilgarn and mineral deposits



Increase of mineralisation (per unit area within buffer) with longer worms; buffer width 2km.

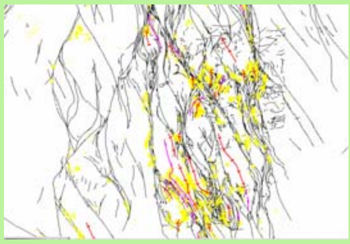


Mineralisation related to depth (as measured by Zwt_max) of gravity worms; buffer width 2km.

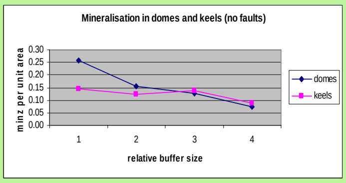
There is a clear relationship between worm length and mineralisation; a less clear but probable relationship between worm Zwt_max and mineralisation, peaking at Zwt_max = 30,000.

Test 3: Mineralisation and regional Anticlines/domes and synclines/keels

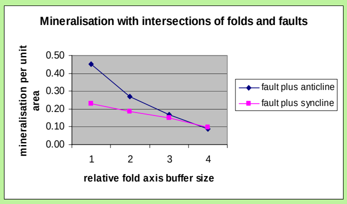
Define domes and keels with buffers (10, 20, 40 km), also major faults (>100km long) with 2, 4 km buffers. Sum mineralisation (both ranked and production) within buffers, divide by buffer area. Define intersections of dome buffers and fault buffers.



Input factors for the domes and keels test



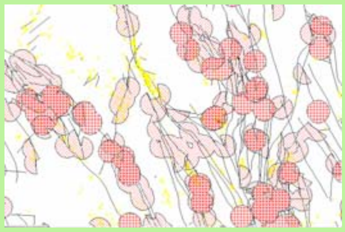
Domes are better mineralised than keels
As buffer size is increased, mineralisation tends to average (as expected)



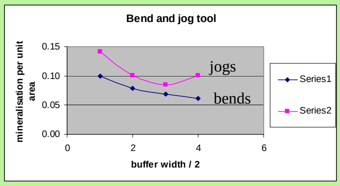
Mineralisation related to intersections of major faults (>100km length) and regional fold axes. Fold buffer widths 1= 5km; 2= 10km; 3= 20km; 4= 40km; Fault buffer width constant at 2km.

Domes are better mineralised than average crust or keels. Intersections of domes with long faults significantly more endowed (in terms of mineralisation per unit area).

Test 4: Mineralisation and bends and jogs



Bends and jogs identified using Mapinfo SDM; these buffered at 2 km intervals. Mineralisation within buffers summed, divided by area of buffers.



There is a clear relationship between bends and jogs, and mineralisation; however, varying the search parameters in the tool (a few tests) does make major differences at this scale of data.

Comparison of Results

Our results illustrate several basic relationships. Across the entire Yilgarn Craton, Au is preferentially associated with regional domes, large faults, small faults adjacent to large faults, and jogs and bends in faults (see synthesis table).

These factors (when combined with other targeting drivers) can be used to generate prospectivity maps.