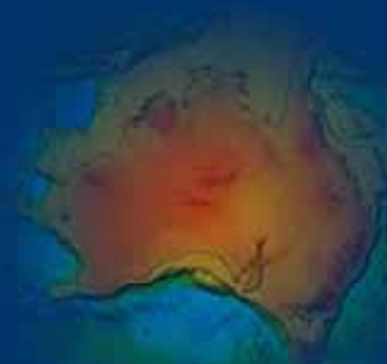
Australian Government

Geoscience Australia

Iron oxide copper-gold mineral systems of the Gawler Craton

Framework and Potential

Gawler Mineral Promotion Project



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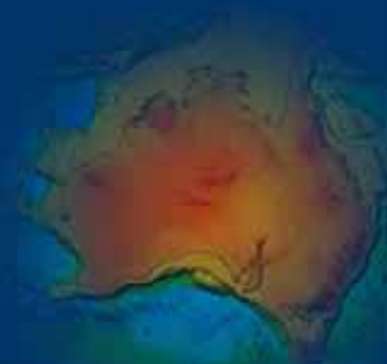
PIRSA–GA

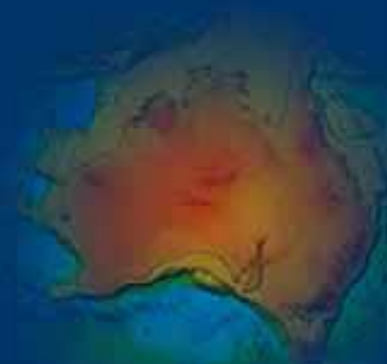
National Geoscience Agreement

To understand the 4-dimensional setting of the IOCG mineralised systems in the Olympic Cu-Au province



OUTLINE

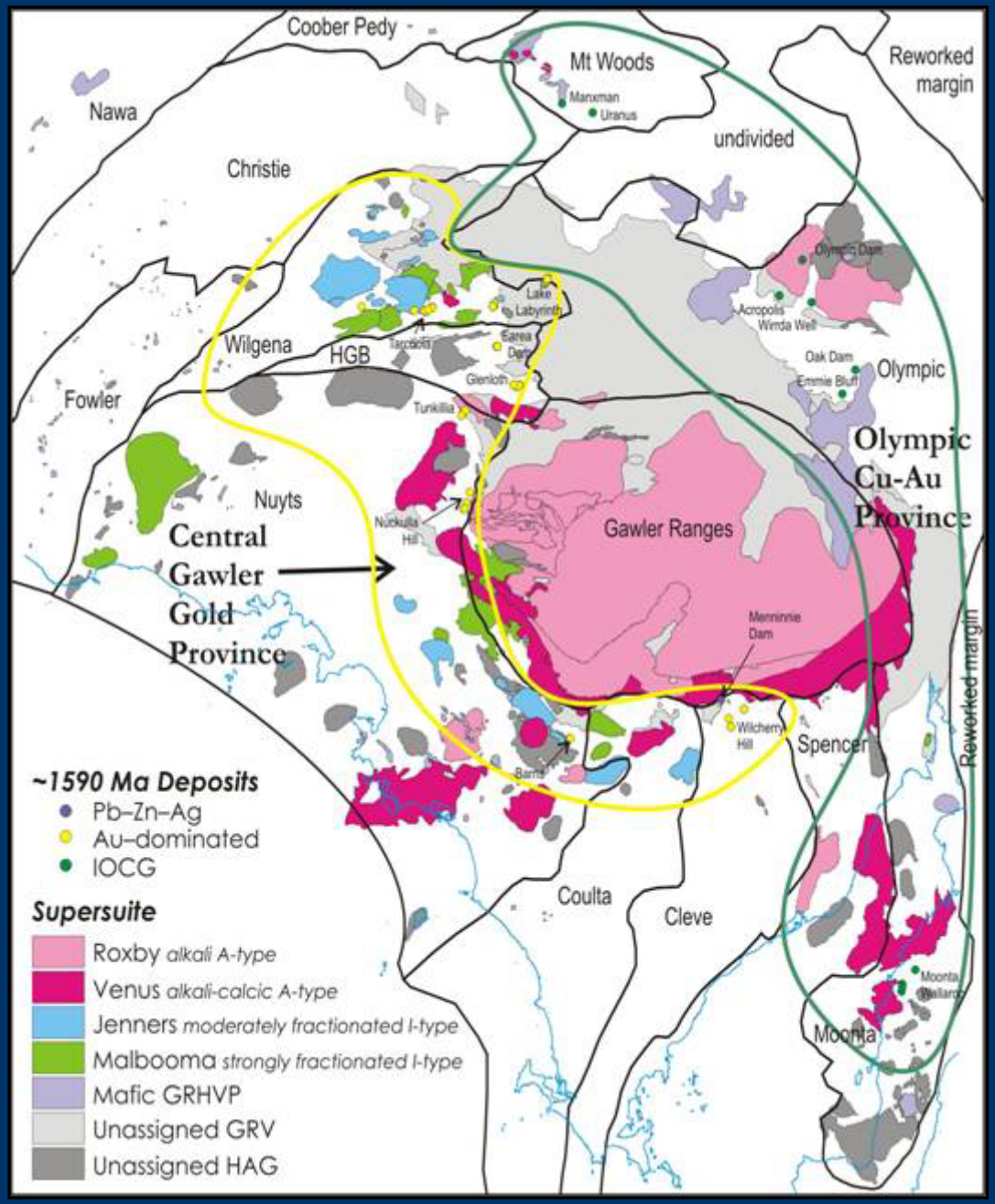
- What the Hiltaba granites tell us about the thermal regime of the mineral systems
- What seismics tell us about the fluid-pathways
- What chemical modelling may tell us about localisation of mineralisation
- How inversion aids drill-targetting



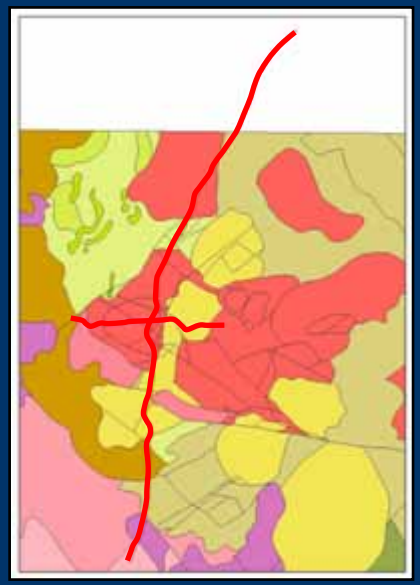
GRANITES

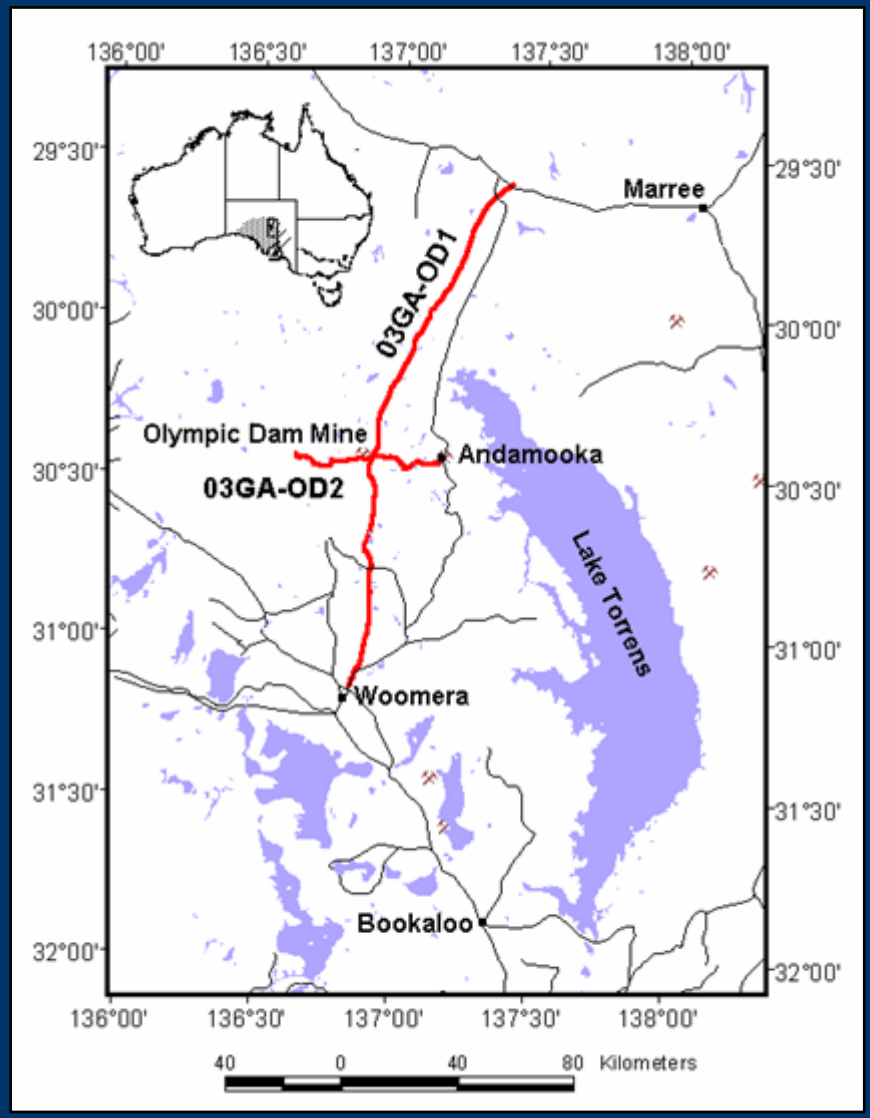
- IOCG associated with very high-T fractionated A-type granites derived from isotopically evolved terranes
- Central Gawler Au associated with high-T fractionated I-type granites derived from less isotopically evolved terranes
- Proximity to granites probably important to mineralisation – A- / I-type subdivision may be important for role of heat, hence type of deposit

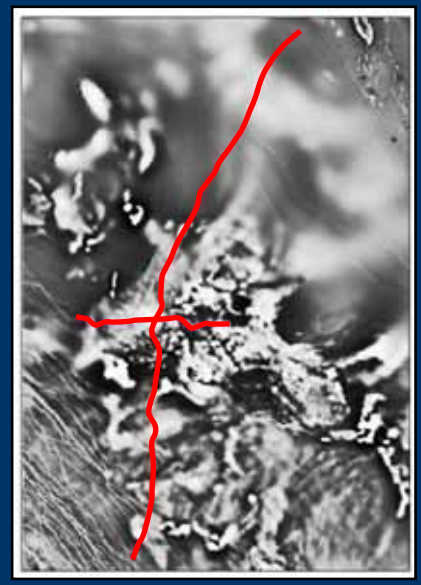
	Jenners	Malbooma	Roxby	Venus
Type	I	I	A	A
Fe/Mg	low	low-mod	high	mod
Ga/Al	low	mod	mod	high
HFSE	low	low	high	high
T_{Zr}°C	720 – 820	720 – 800	780 – 900	740 – 880
Rb/Sr	low	low-high	mod-high	mod-high
εNd_t	-3 – +2	-3 – +2	-6 – +1	-5 – +1
Assoc-iation	Au	Au	Cu-Au	Cu-Au

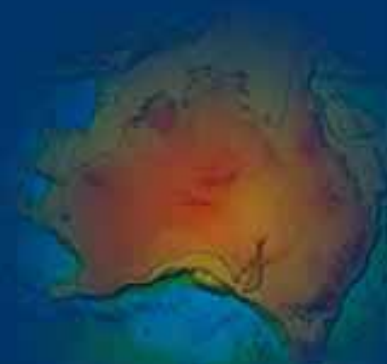

Coober Pedy
Mt Woods
Manxman
Uranus
Reworked margin
Nawa
undivided
Christie
Olympic Dam
Lake Labyrinth
Acropolis
Wirrda Well
Wilgena
HGB
Tarcoola
Barea Dam
Oak Dam
Emmie Bluff
Olympic
Glenloth
Fowler
Tunkillia
Olympic Cu-Au Province
Nuyts
Nuckulla Hill
Gawler Ranges
Central Gawler Gold Province
Menninnie Dam
Wilcherry Hill
Spencer
Reworked margin
Barns
~1590 Ma Deposits
Pb–Zn–Ag
Au–dominated
IOCG
Coulta
Cleve
Supersuite
Roxby alkali A-type
Venus alkali-calcic A-type
Jenners moderately fractionated I-type
Malbooma strongly fractionated I-type
Mafic GRHVP
Unassigned GRV
Unassigned HAG
Moonta
Moonta Bellaray

SEISMIC LINES





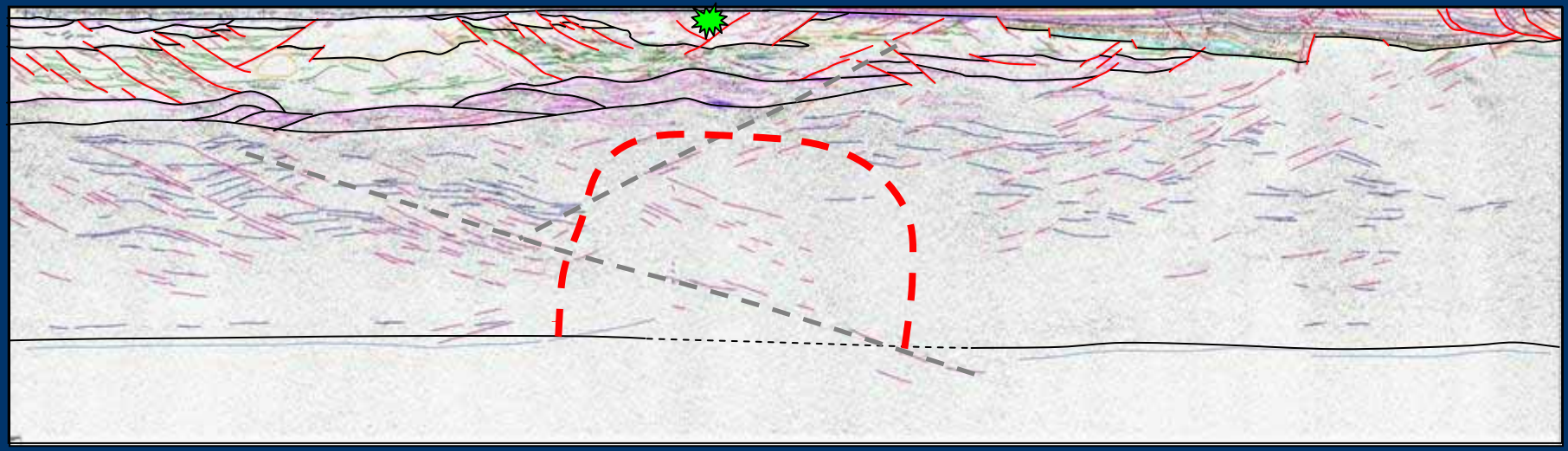




S

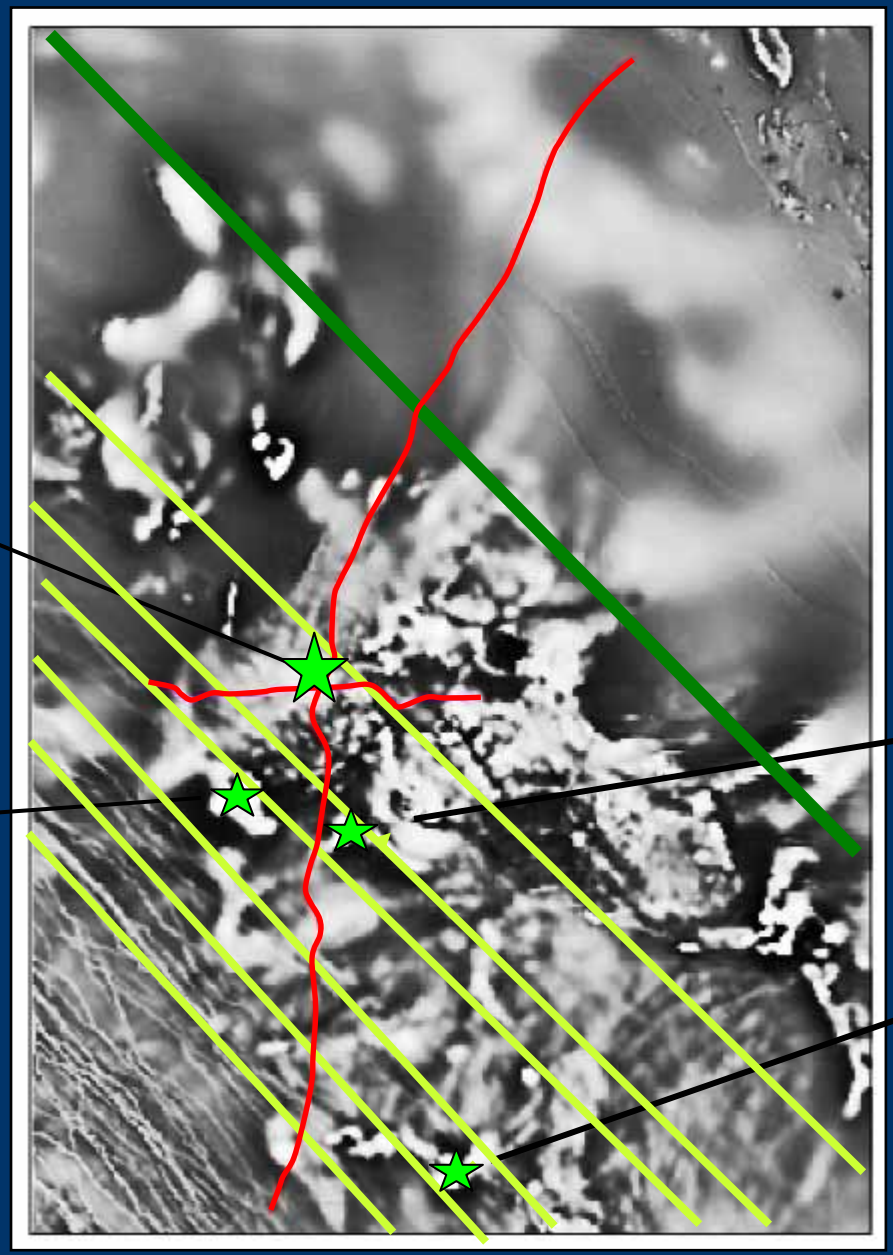
OD

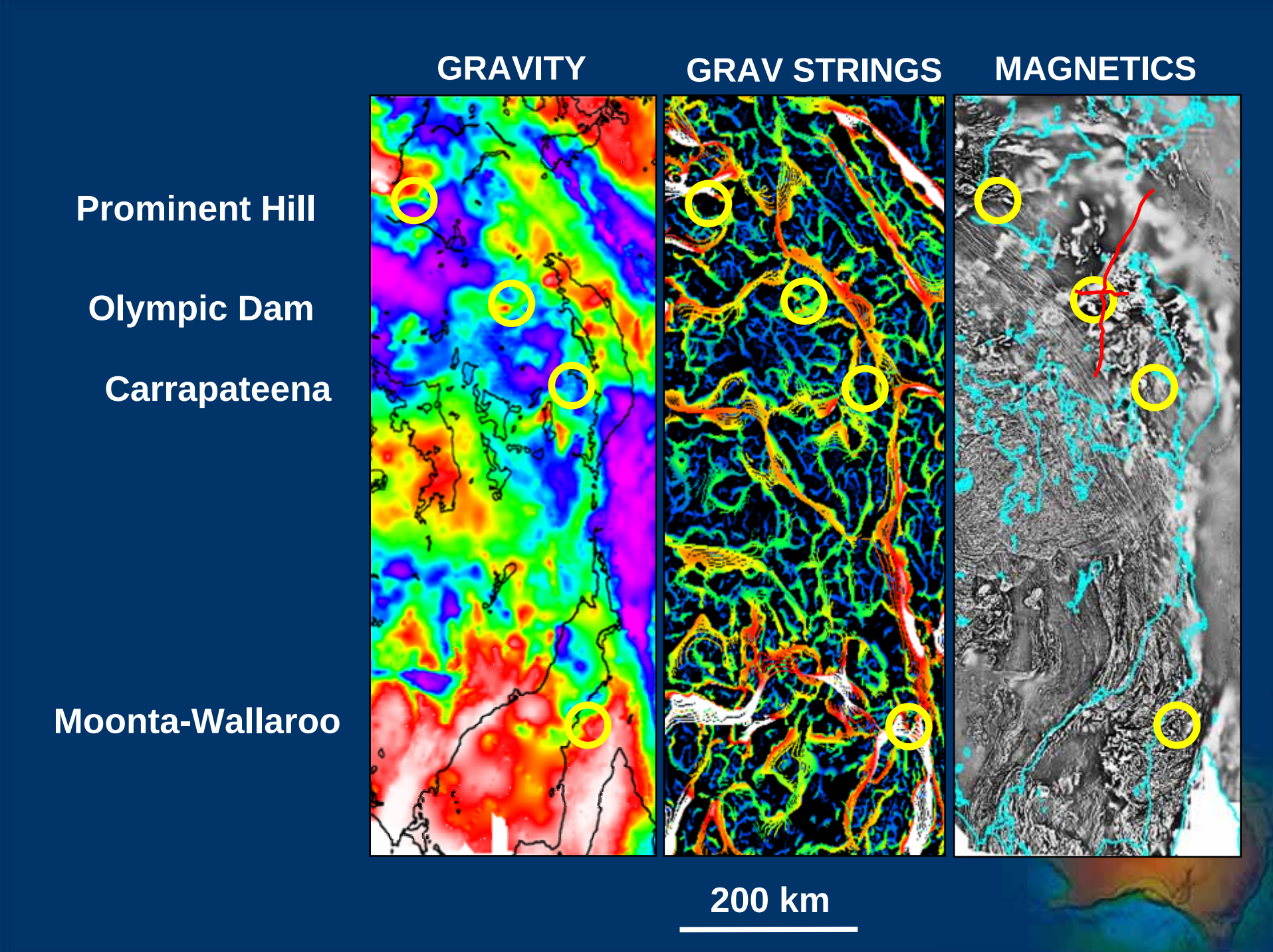
N



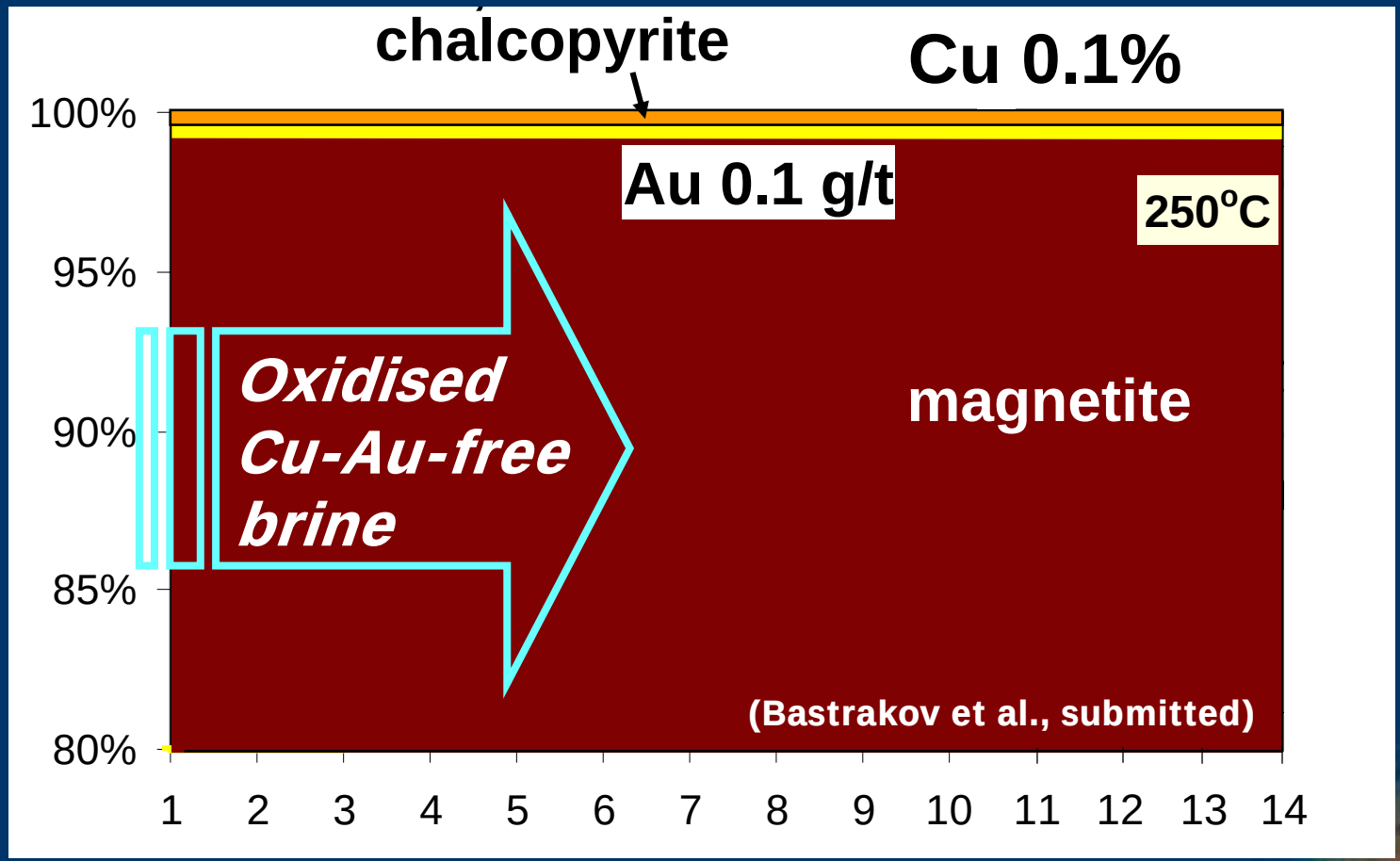
V=H

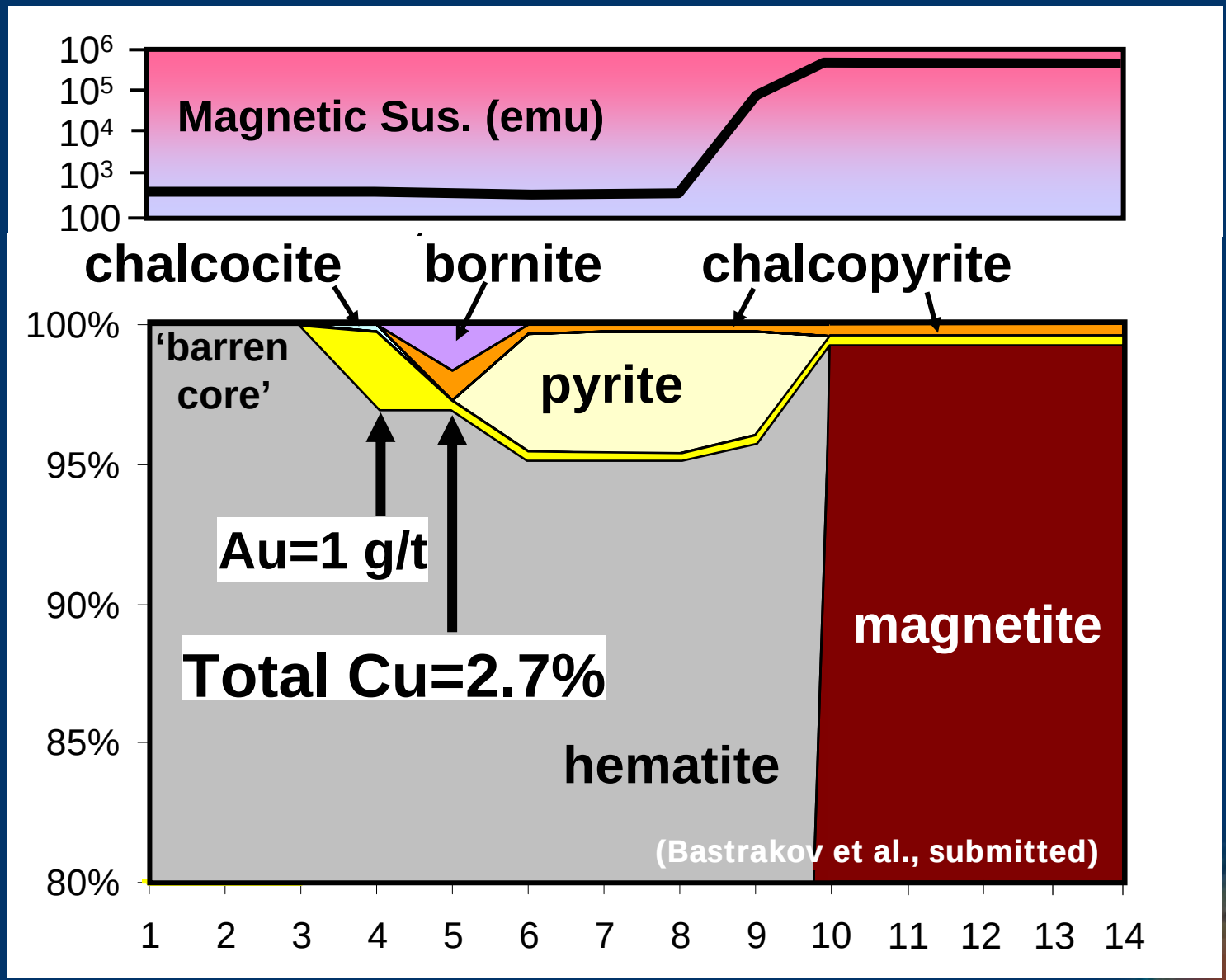
50 km


Olympic Dam
Acropolis
Wirrda Well
Emmie Bluff
50 km

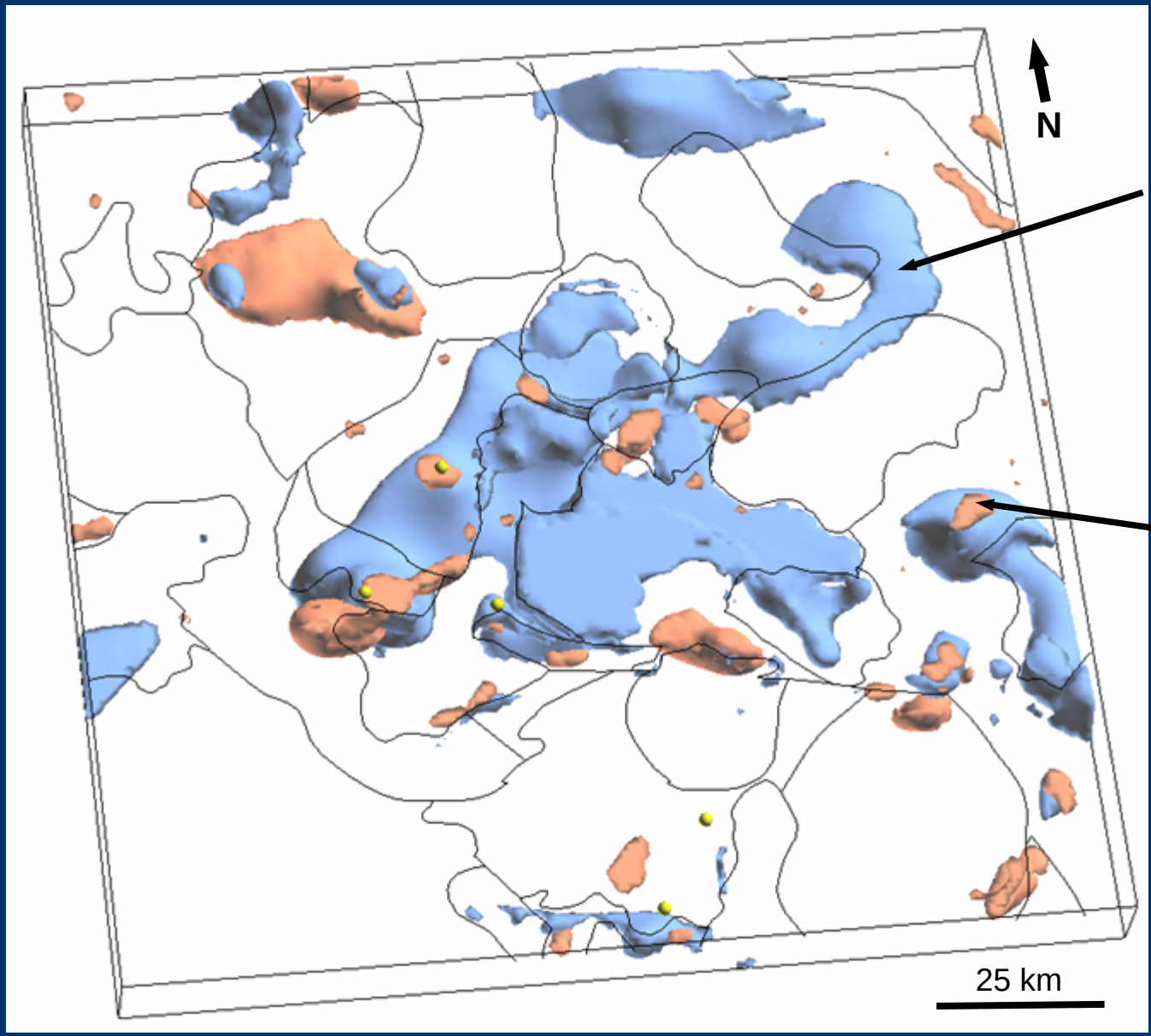

GRAVITY
GRAV STRINGS
MAGNETICS
Prominent Hill
Olympic Dam
Carrapateena
Moonta-Wallaroo
200 km

CHEMICAL MODELLING



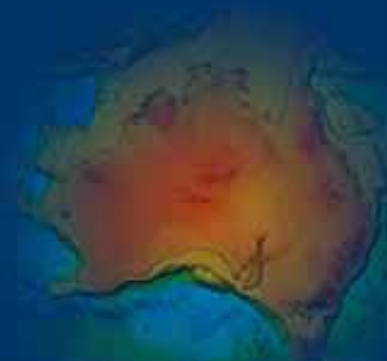

Magnetic Sus. (emu)
10^6
10^5
10^4
10^3
100
chalcocite
bornite
chalcopyrite
100%
95%
90%
85%
80%
'barren core'
pyrite
Au=1 g/t
Total Cu=2.7%
magnetite
hematite
(Bastrakov et al., submitted)
1 2 3 4 5 6 7 8 9 10 11 12 13 14
MINERAL VOL. %
Rock segment (or distance)

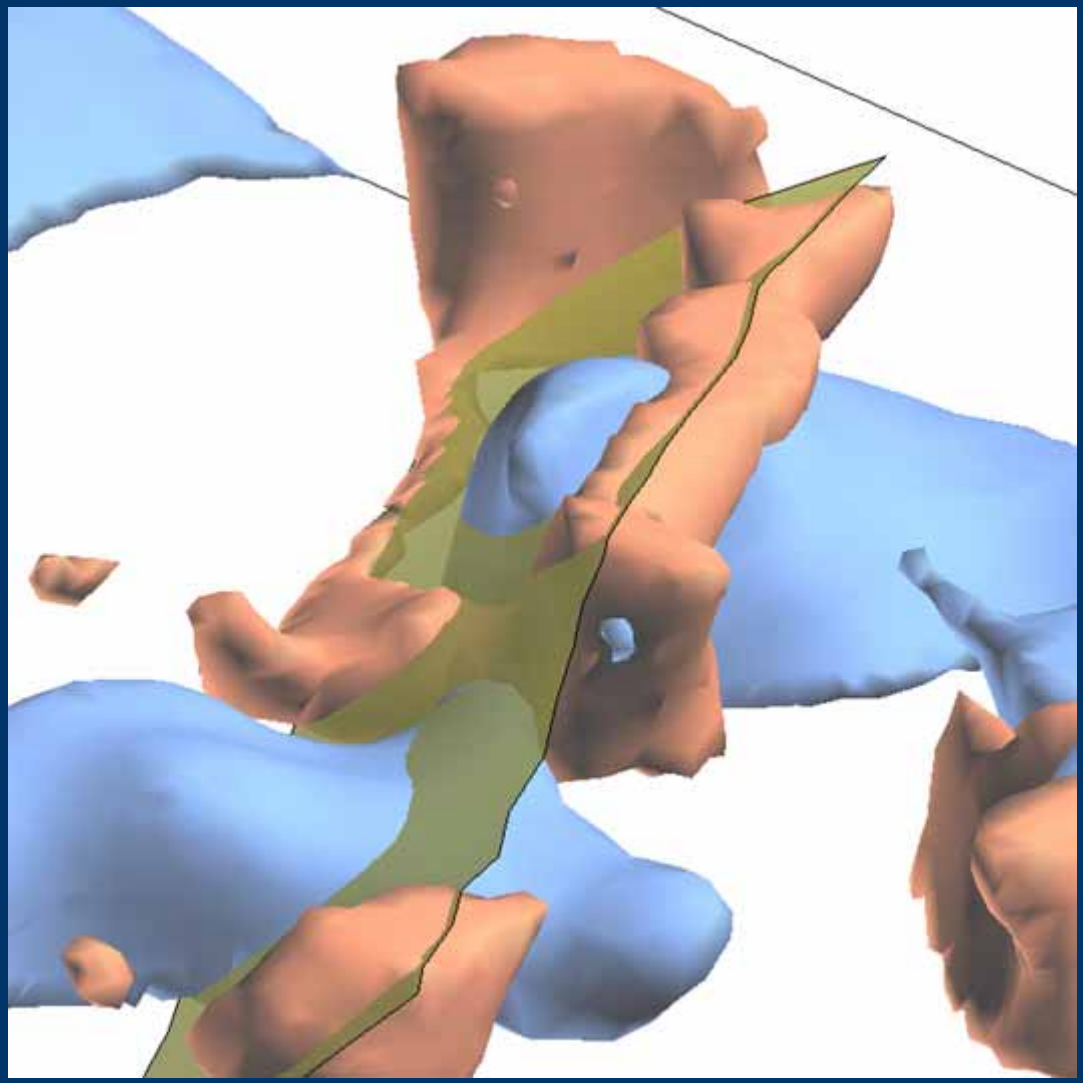
POTENTIAL-FIELD INVERSION



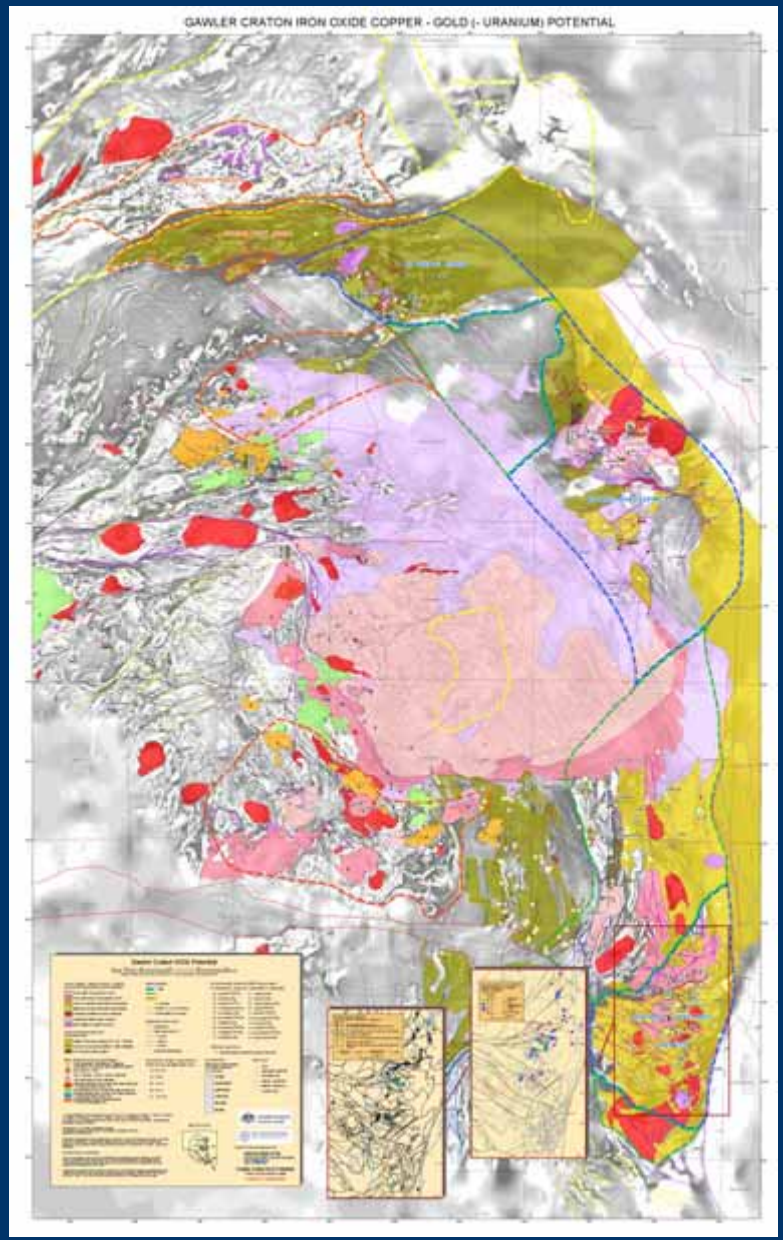
1.5% “magnetite”
Includes all susceptible minerals as their magnetite equivalent

0.5% “haematite”
Includes hematite, sulfides, other dense minerals, and remanent magnetisation





10 km



IOCG POTENTIAL MAP

1.5 VD background

Key metased units

Hiltaba-GRV classification (Budd, 2006)

Faults active at 1575-1595 Ma

Anomalous Cu

IOCG alteration assemblages

IOCG alteration zones

Geochronology & Sm-Nd

Areas ranked by potential

Specific IOCG targets not identified – use district- to deposit-scale targeting criteria

SUMMARY

Granites indicate thermal conditions of mineral system

Crustal architecture & fluid-pathways

Mineralisation in hematite adjacent to magnetite

Potential-field inversion for 3-D mapping of Fe oxide alteration

www.ga.gov.au/minerals/research/regional/gawler/gawler.jsp

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