DELIVERING RESULTS

Department for Manufacturing, Innovation, Trade, Resources and Energy

Mapping mineral systems under cover: using drill rigs instead of geological hammers

Adrian Fabris and Simon van der Wielen

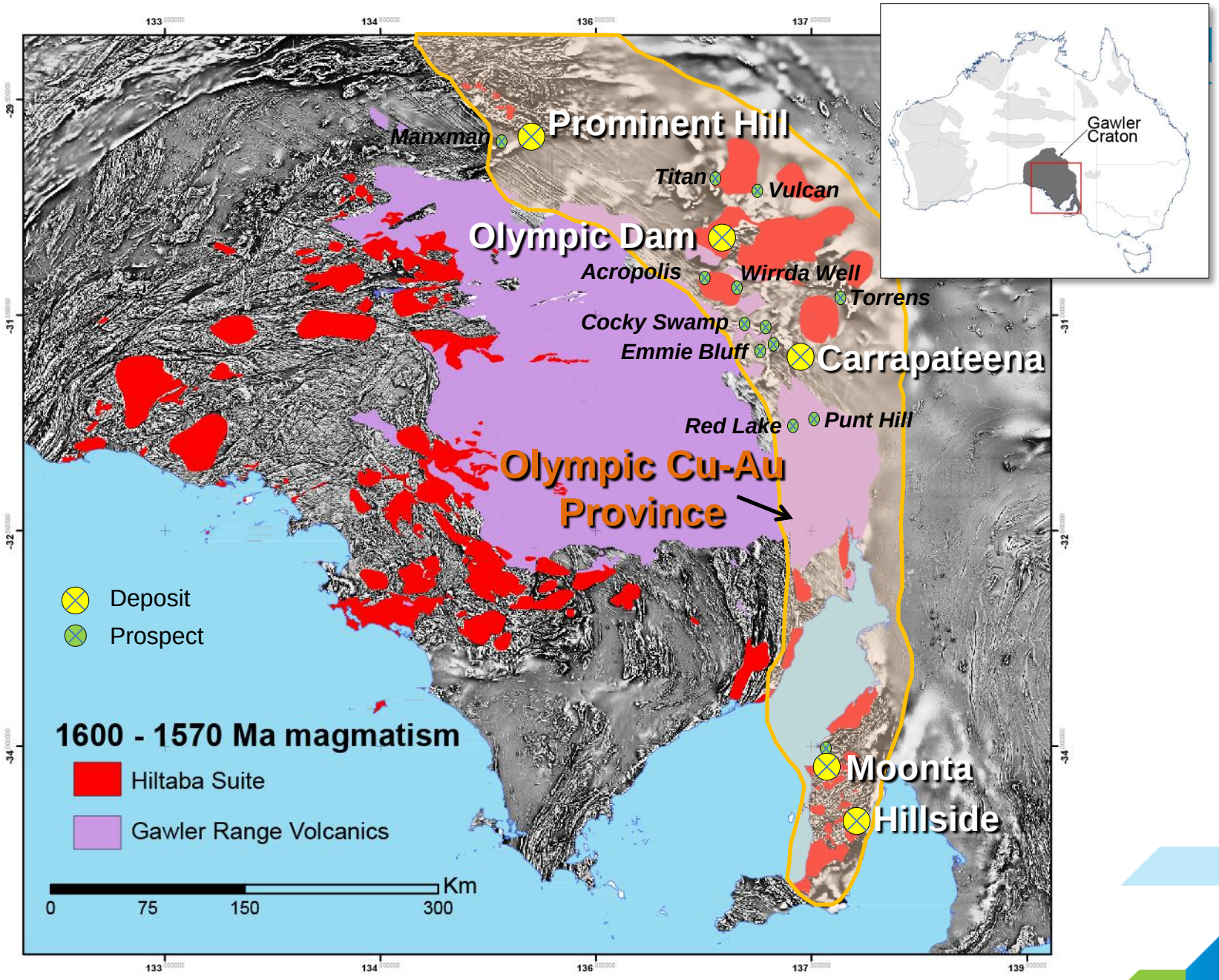
Senior Geologist/DET CRC Project Leader

Government of South Australia

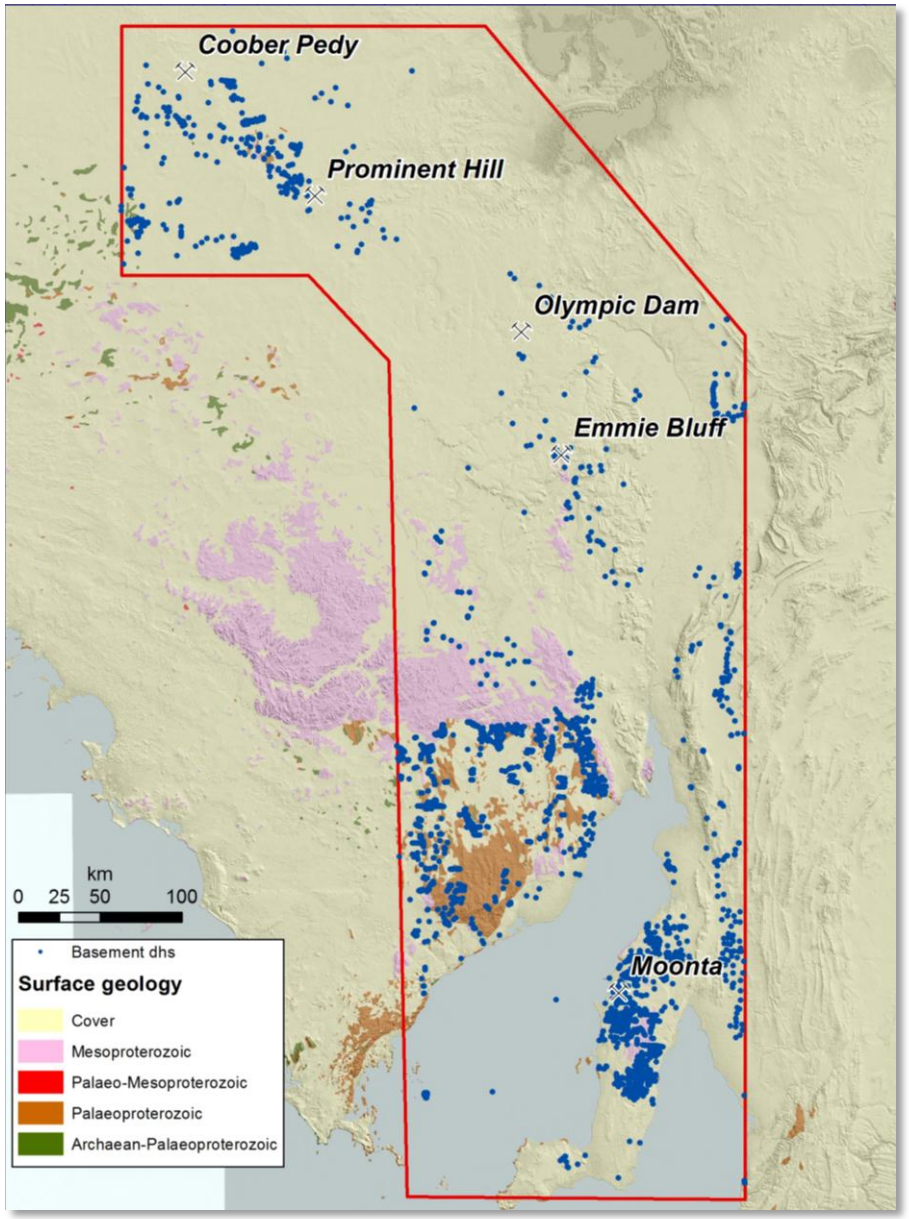
Department for Manufacturing, Innovation, Trade, Resources and Energy

PACE 2020 exploration mining energy global

DEEP EXPLORATION TECHNOLOGIES CRC Uncovering the future


Gawler Craton
Prominent Hill
Manxman
Titan
Vulcan
Olympic Dam
Acropolis
Wirrda Well
Torrens
Cocky Swamp
Emmie Bluff
Carrapateena
Red Lake
Punt Hill
Olympic Cu-Au Province
Deposit
Prospect
1600 - 1570 Ma magmatism
Hiltaba Suite
Gawler Range Volcanics
Km
0
75
150
300
Moonta
Hillside

Basement intersecting drill holes



- Thick cover (0 to >1000m) makes exploration risky and expensive.
- Sub-surface mapping required!
- GSSA – map alteration and geochemical signatures using publically available drill holes.

Multi-data approach

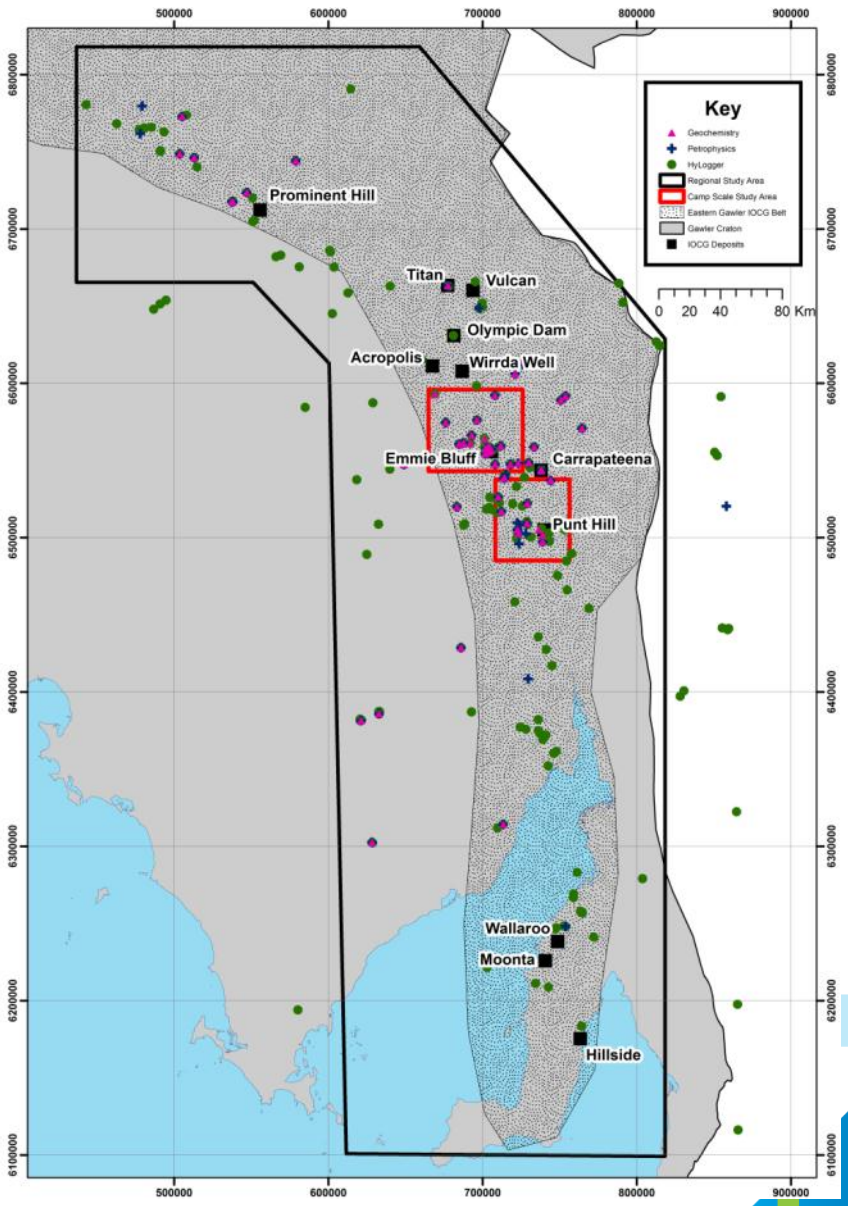
Geochemisty (Pink)
- 61 drill holes sampled
- 1,760 analyses

HyLogger™ (Green)
- 214 drill holes scanned or compiled
- 83,606 metres (VNIR-SWIR)
- 20,889 metres (TIR)

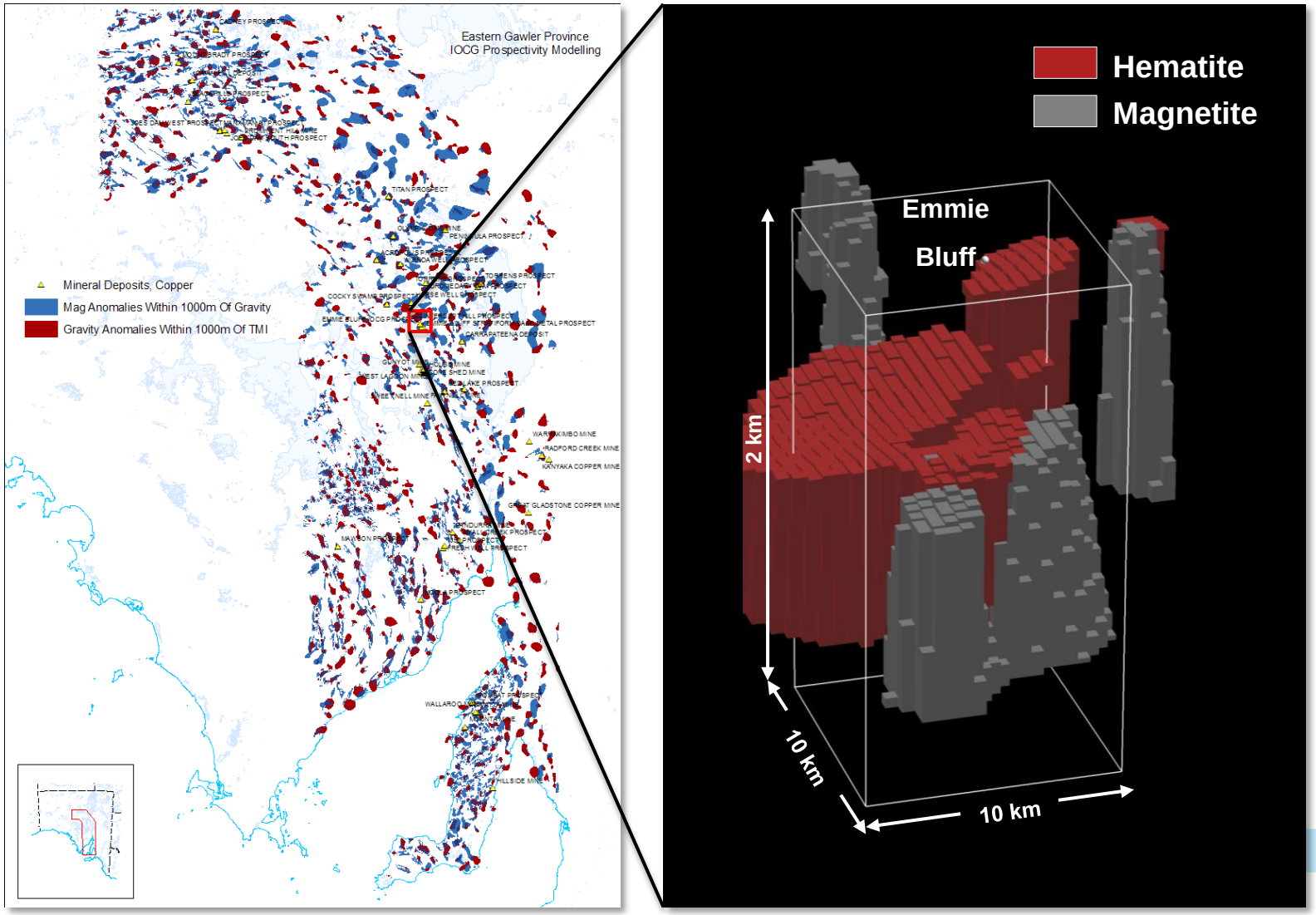
Petrophysics (Blue)
- 65 drill holes analysed
- 11,628 magnetic susceptibility and 5,455 density measurements

Geophysical Inversion
- Two camp scale gravity and magnetic inversions

Case Studies (Red)
- Emmie Bluff and Punt Hill



Mapping using geophysical characteristics



Sampling strategy

- Collect consistent, high quality geochemical data from drill holes at 1m per 10m.

Drill core sampling

Each samples analysed (65 elements);

- Lead collection fire assay – Au, Pt, Pd
- 4 acid (ICP-OES) – Cu, Li, Ni, Pb, S, Zn
- Carbonate fusion/SIE – F
- 4 acid (ICP-MS) – Ag, As, Bi, Cd, Co, Cs, Ge, In, Mo, Nb, Re, Sb, Se, Te, Ti
- Lithium borate fusion (ICP-OES) – Al, Ca, Cr, Fe, K, Mg, Mn, Na, P, Si, Ti, V
- Lithium borate fusion (ICP-MS) – Ba, Be, Ce, Dy, Er, Eu, Ga, Gd, Hf, Ho, La, Lu, Nd, Pr, Rb, Sc, Sm, Sn, Sr, Ta, Tb, Th, Tm, U, W, Y, Yb, Zr

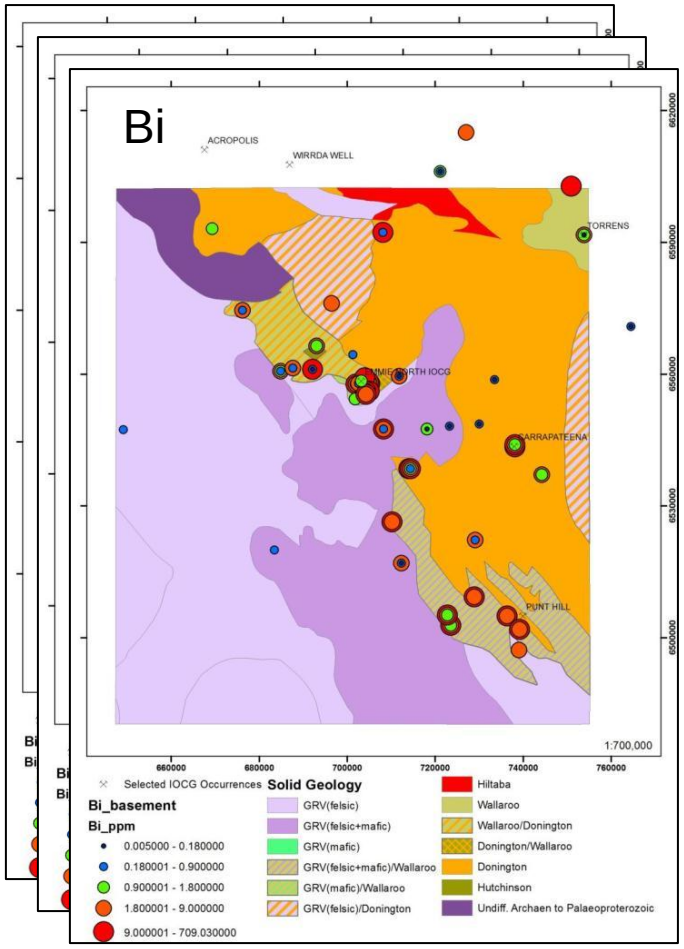
Cover-basement unconformity sampling

- Unconformity sample – base of cover sample with a focus on gravel intervals.

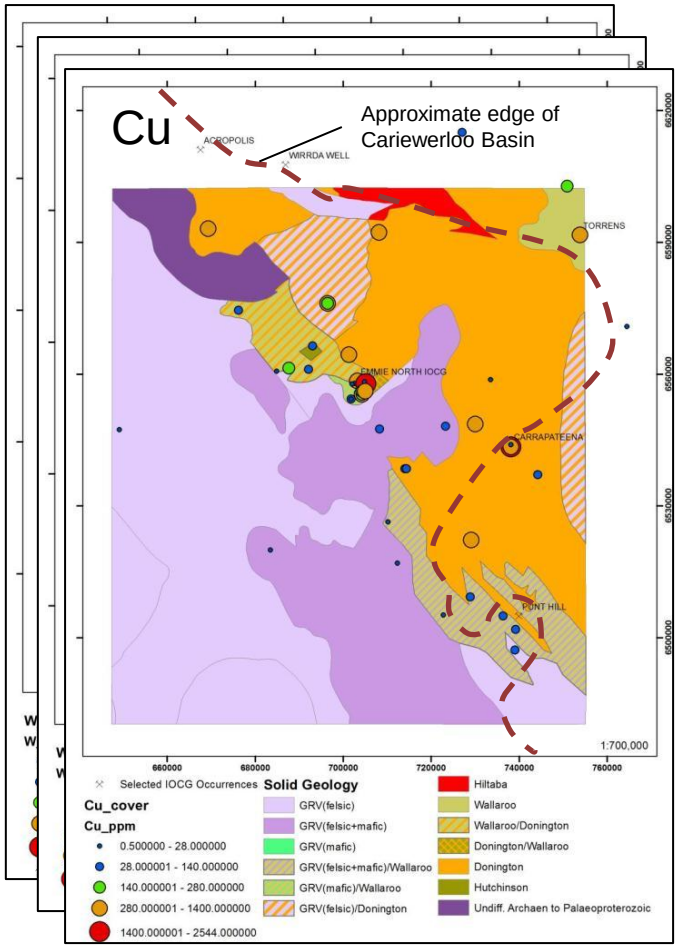
Hematite cementation of Pandurra Fm just above basement unconformity

Hematite-rich clasts within Pandurra Fm

Element maps show regional trends

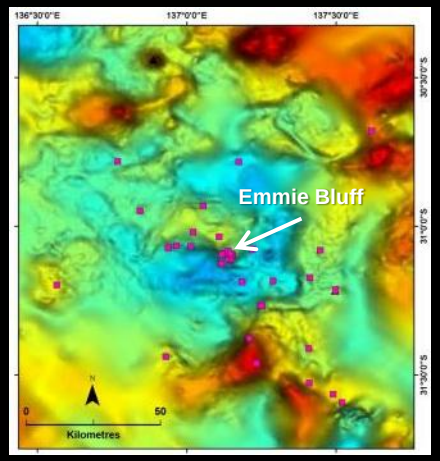


Basement



Cover

3D perspective view



Torrens

Emmie Bluff

Carrapateena

Punt Hill

20km

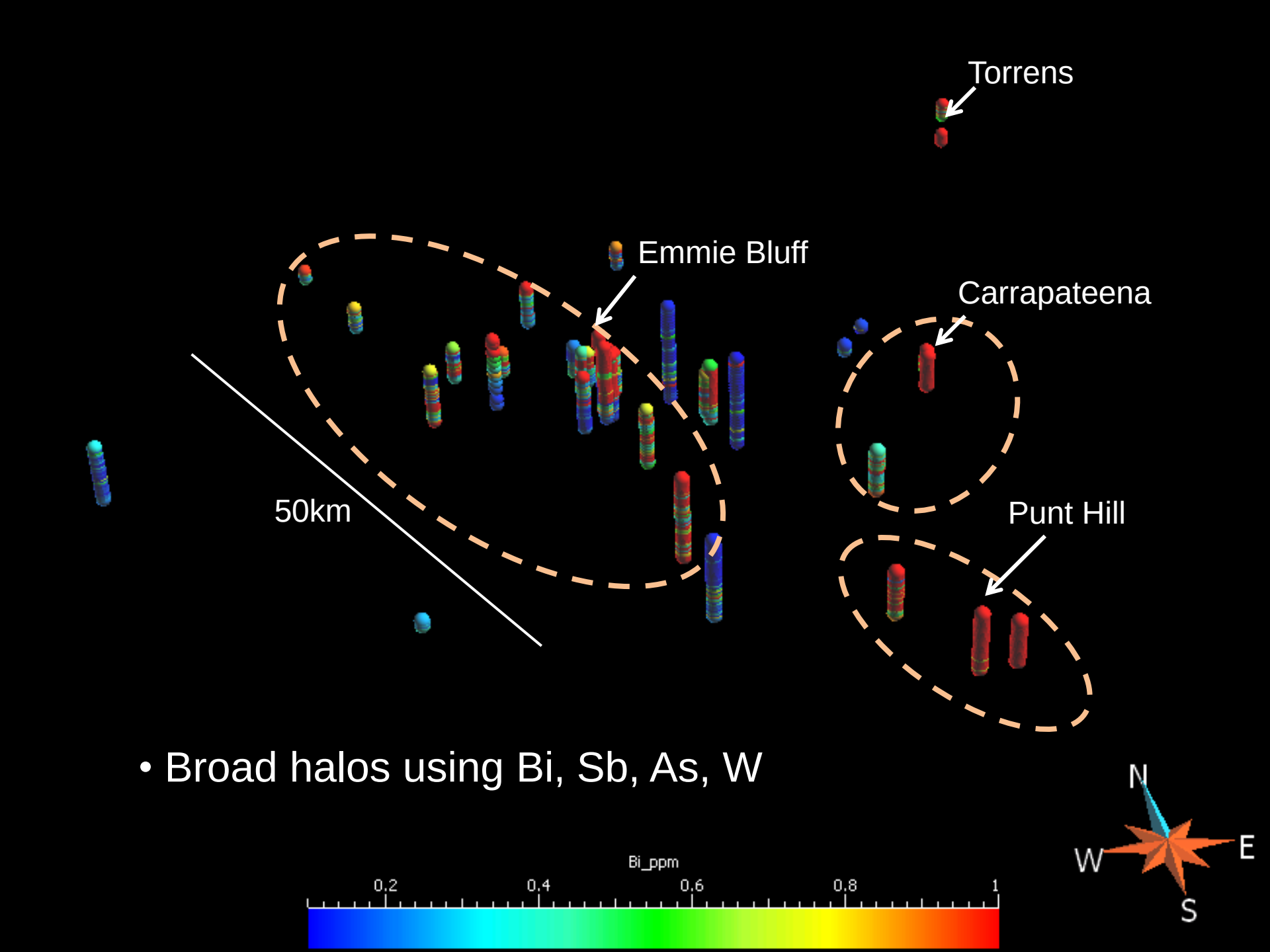
Cu_ppm

100 200 300 400 500 600

N

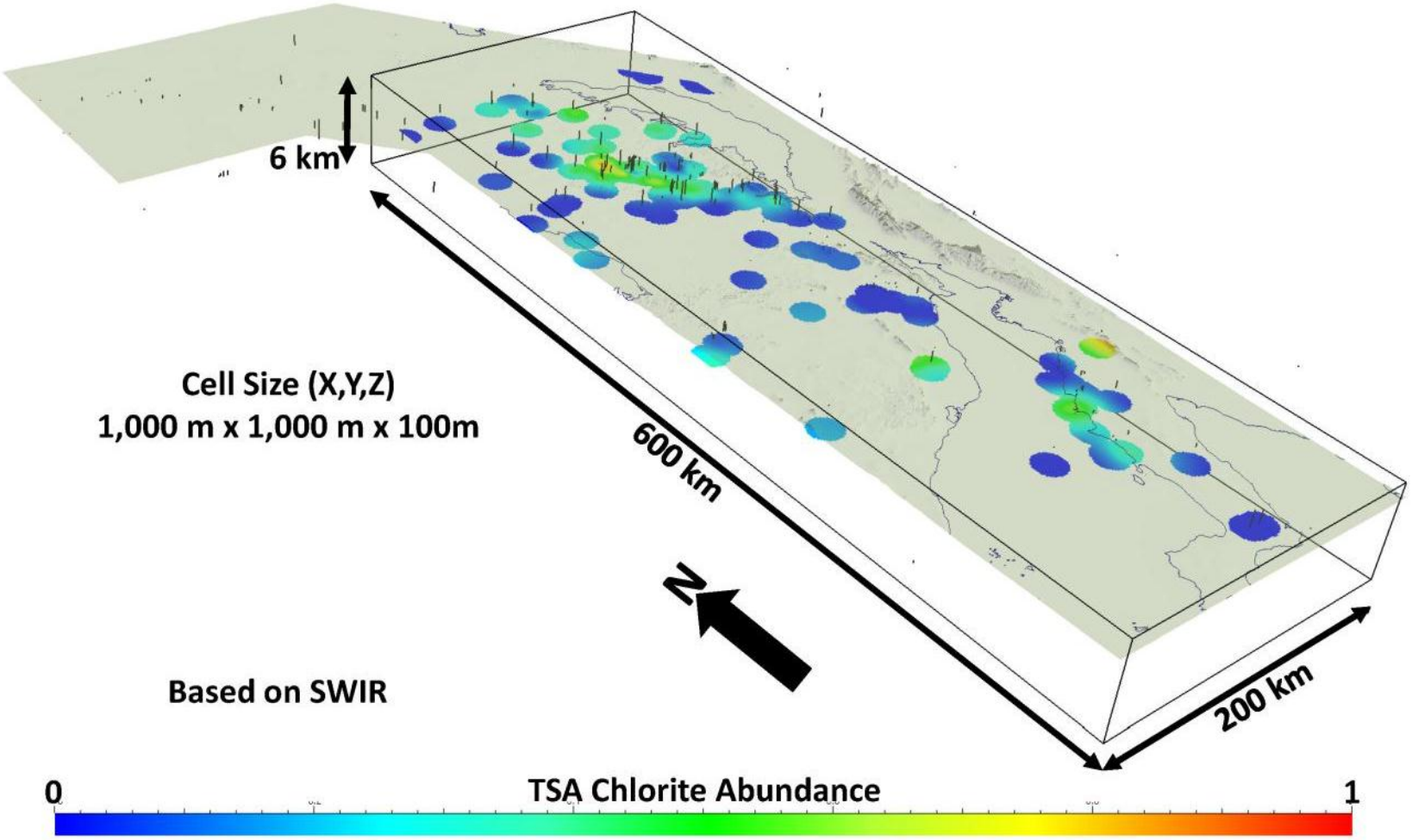
W E

S



- Broad halos using Bi, Sb, As, W

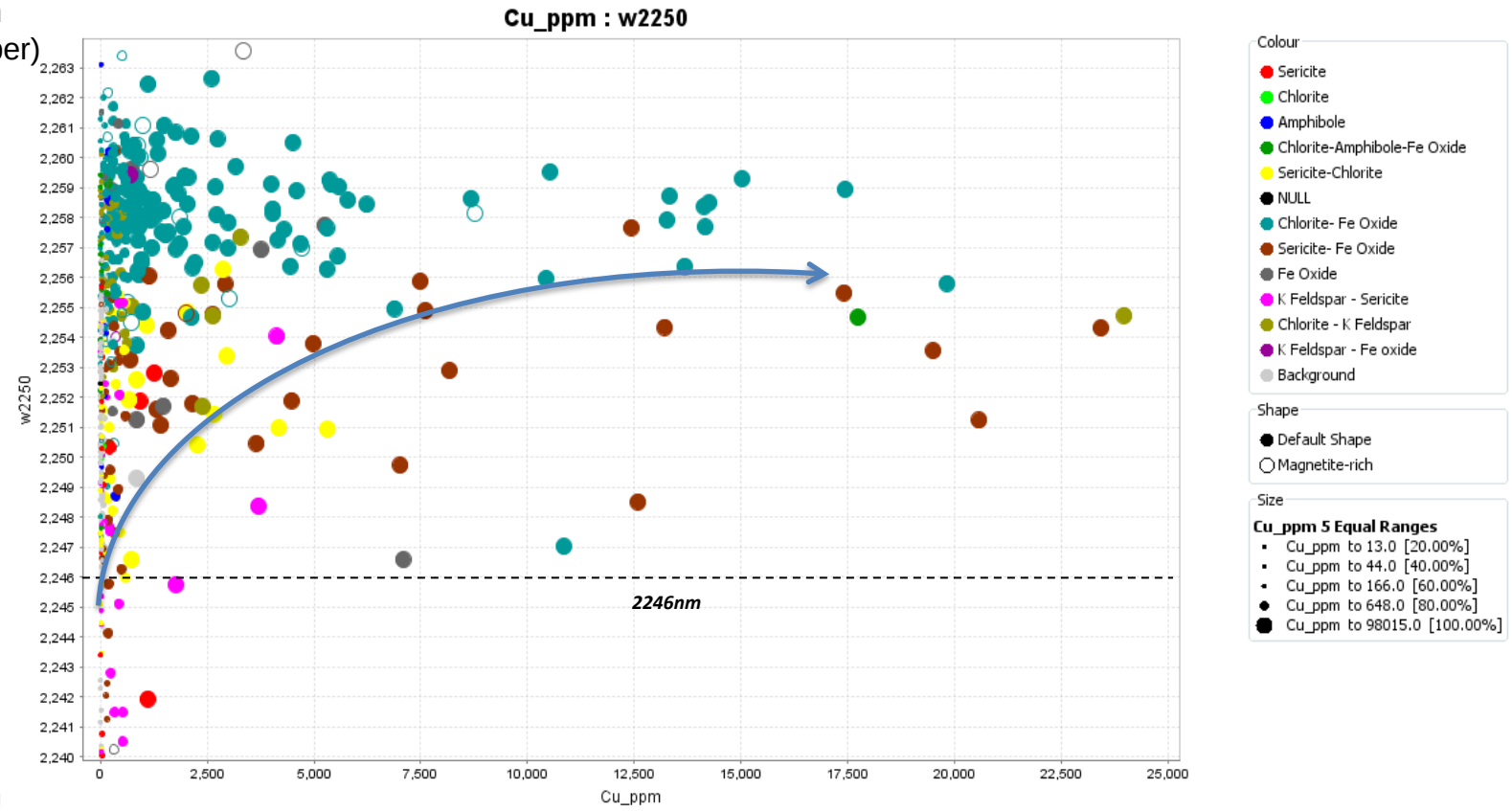
HyLogger™ - Chlorite Abundance



- Hylogger™ – semi-automated spectral scanner used to interpret mineralogy

Cu versus 2250nm wavelength feature

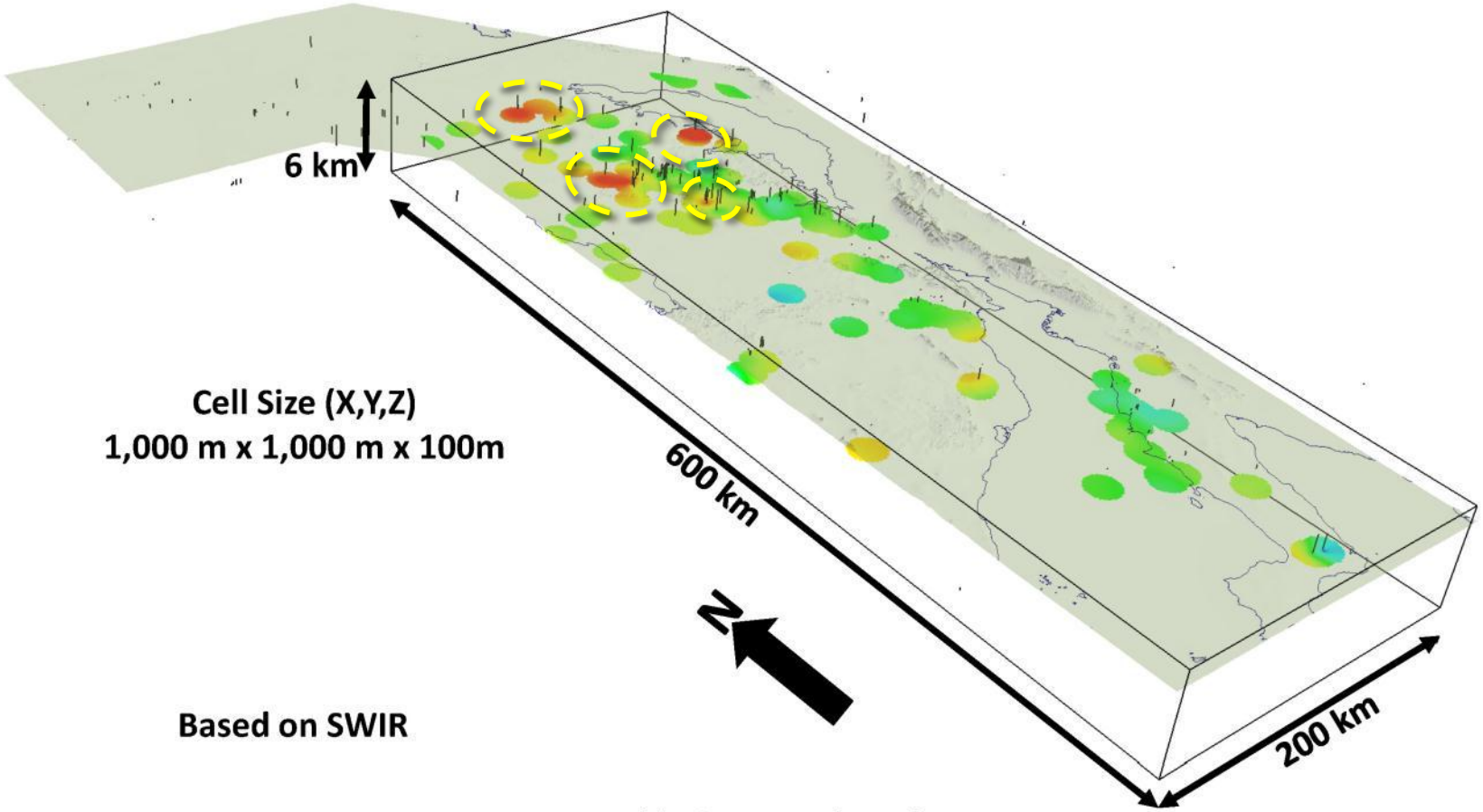
Long Wavelength (Fe-end member)



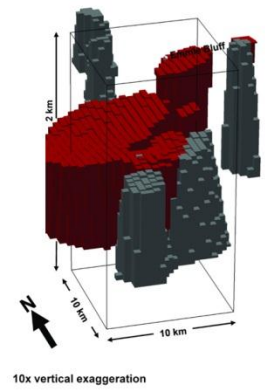
Short Wavelength (Mg-end member)

- High Cu associated with w2250>2246nm

HyLogger™ - Chlorite Wavelength



3D Data Integration

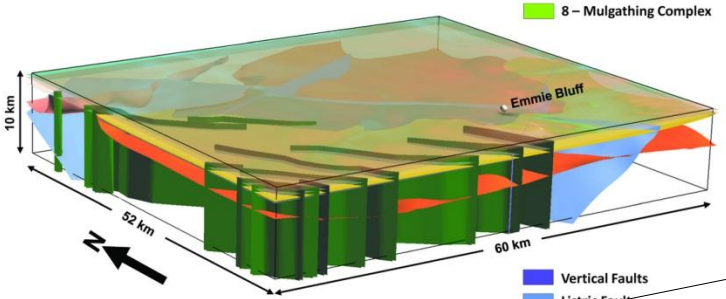


10x vertical exaggeration

Alteration Voxet

- Hematite
- Magnetite
- Hematite – Magnetite
- Albite
- K-Feldspar
- Sericite
- Sericite – Chlorite
- Chlorite

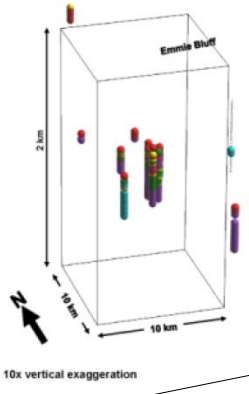
500 m x 500 m x 10 m cell size



1x vertical exaggeration

- 0 – DEM Surface
- 1 – Neoproterozoic
- 2 – Gairdner Dyke Swarm
- 3 – Pandurra Formation
- 4 – Gawler Range Volcanics
- 5 – Wallaroo Group
- 6 – Donington Suite
- 7 – Hutchinson Group
- 8 – Mulgathing Complex

- Vertical Faults
- Listric Faults



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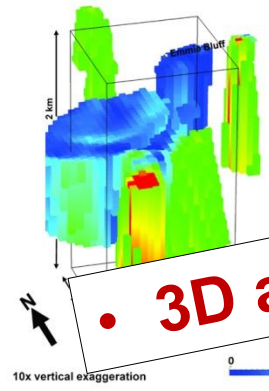

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0 — Magnetic Susceptibility — 0.06

• 3D alteration models, 3D prospectivity maps, 3D queries

3D Model

- 0 – DEM Surface
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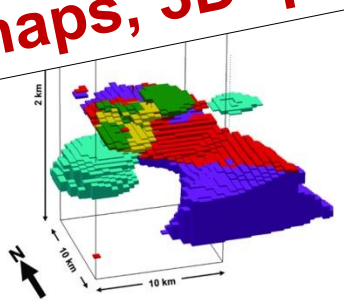

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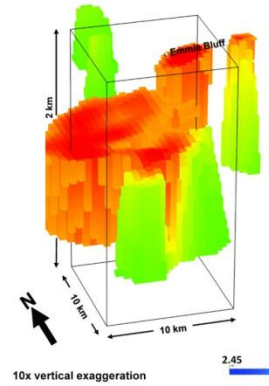

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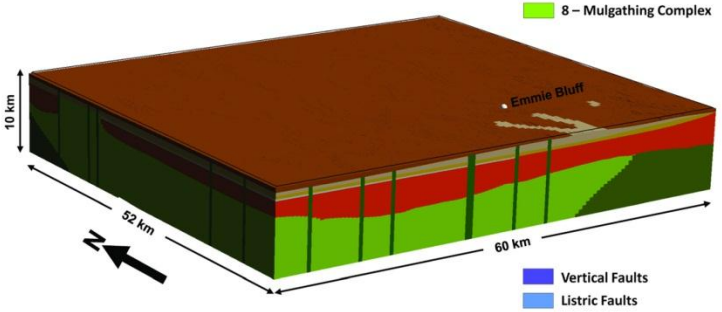
2.45 — Density — 2.70



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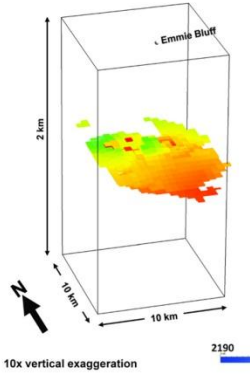
- Listric Faults

Geological Voxet



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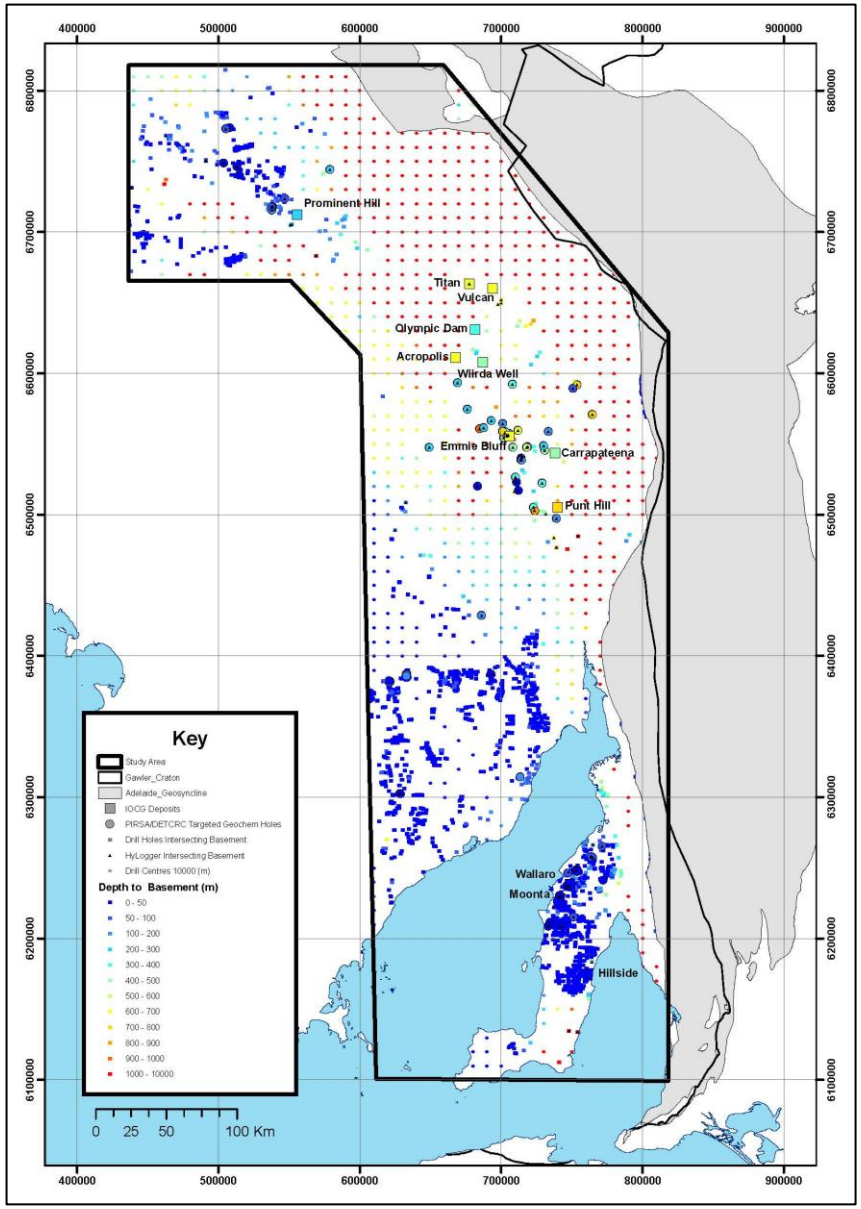
2190 — Wavelength 2200 nm absorption feature — 2220

Mineral systems drilling program



- IOCG deposits have large footprints
- Mineral systems drilling program in 2015 – DMITRE + DET CRC, potential industry partner.