Alteration vectors to Olympic Dam-style and Ernest Henry-style Cu-Au mineralisation in the Moonta Subdomain

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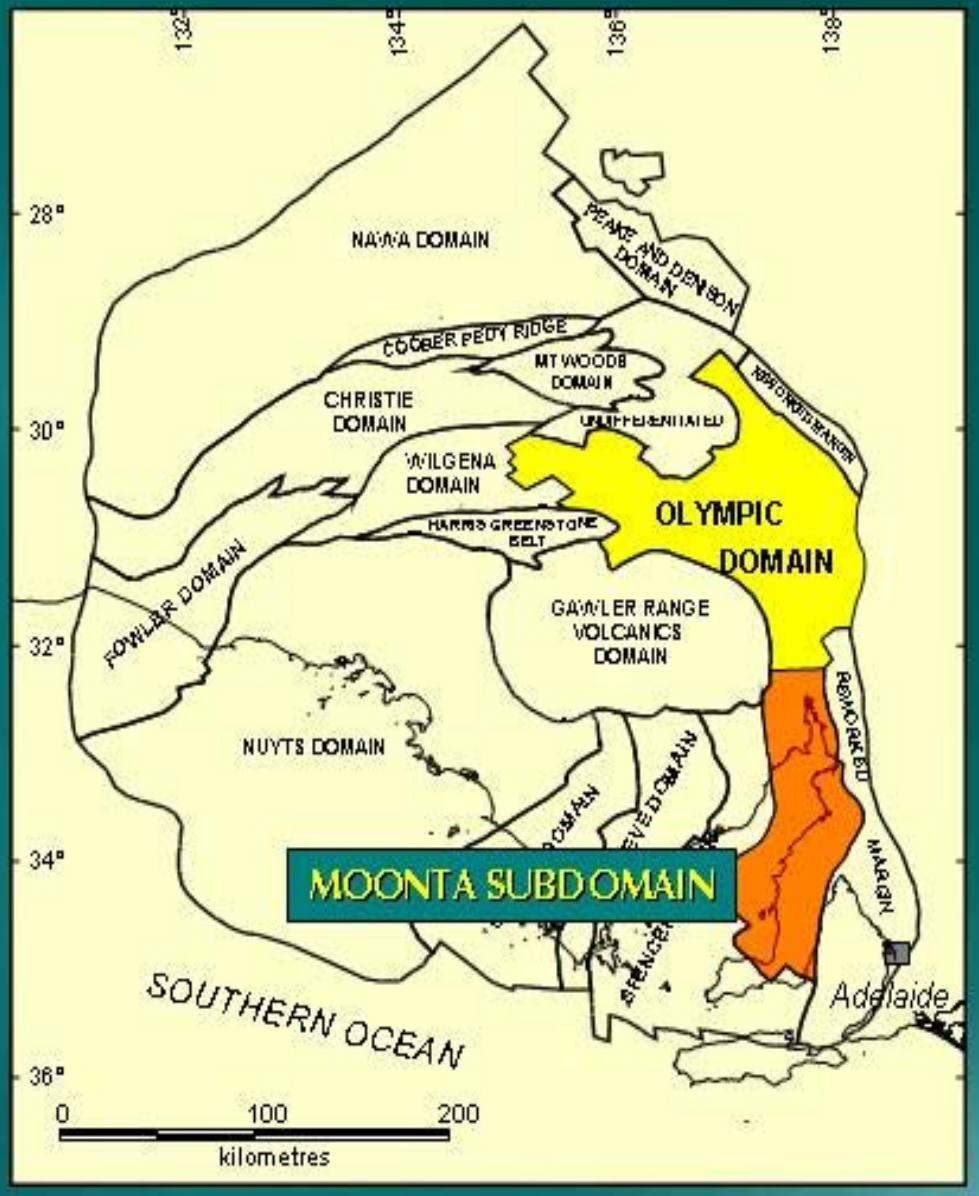
Tectonic elements of the Gawler Craton

(Ferris et al, 2002)

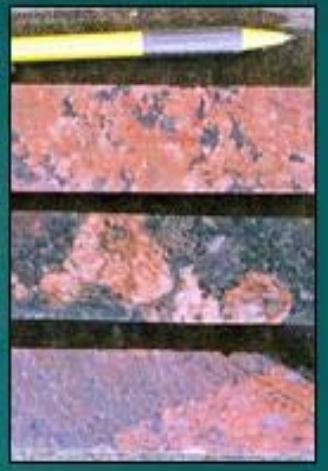


A telescoped regional alteration system

Part 1

- Early, high temperature, magnetite-bearing alteration

  - Calcsilicate - albite - magnetite (CAM)
  - Magnetite - biotite (BM)
  - ductile structures
  - Cloncurry Belt setting
  - potential for Ernest Henry style Cu-Au associated with magnetite-biotite alteration
  - iron-rich host rocks for later Cu-Au mineralisation through oxidation-sulphidation reactions

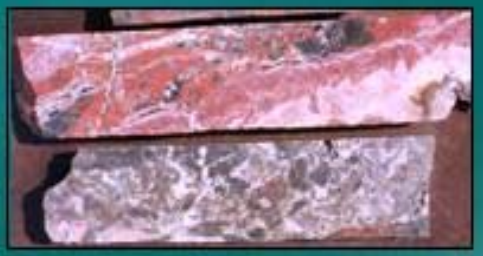


A telescoped regional alteration system

Part 2

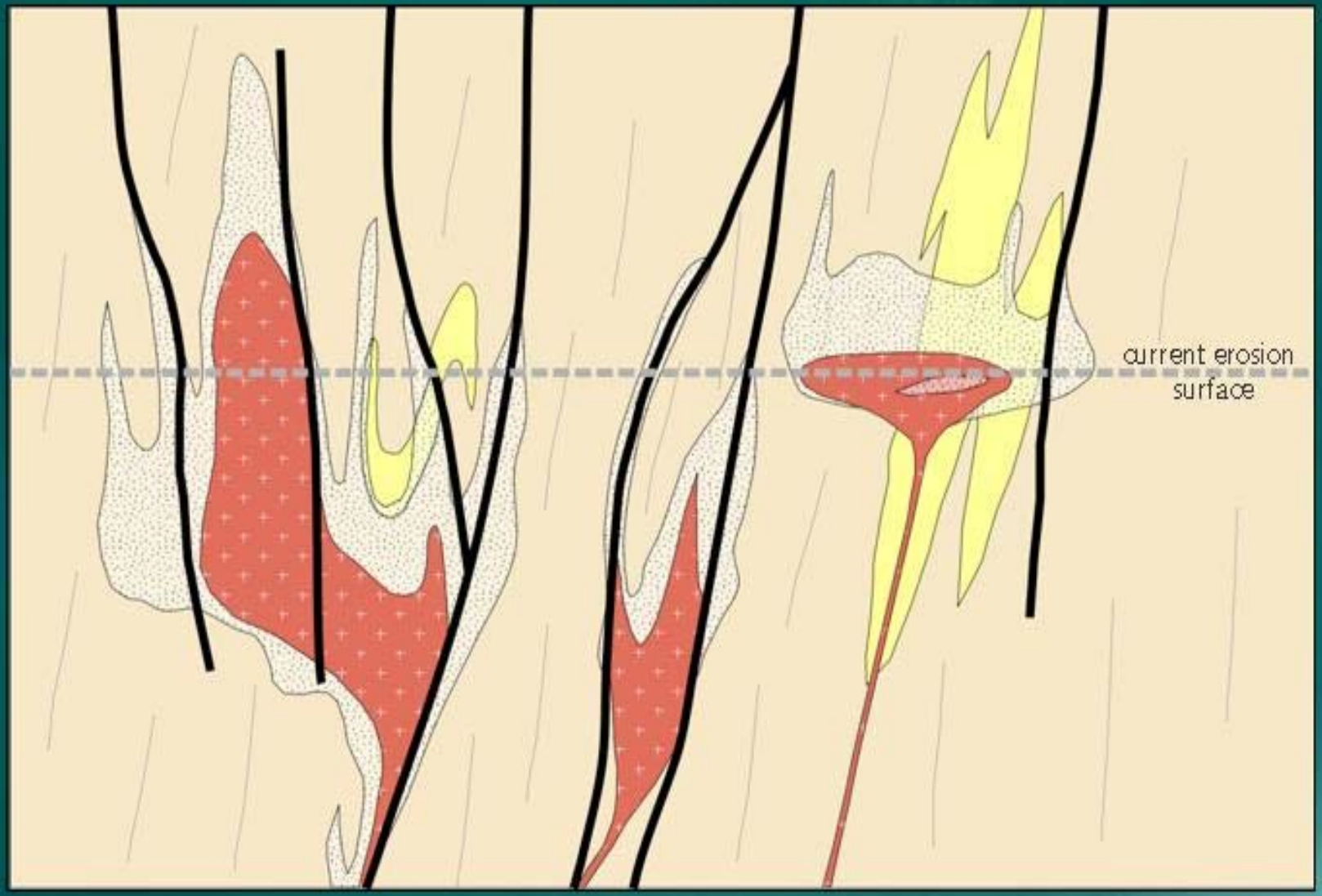
- Later, lower temperature, hematite-bearing alteration
  - chlorite, quartz, kfeldpsar, hematite
  - pyrite and chalcopyrite
  - ductile - brittle structures
  - potential for Olympic Dam style Cu-Au

- Latest, low temperature, "epithermal" style alteration
  - kaolinite, quartz, carbonate, hematite
  - brittle structures

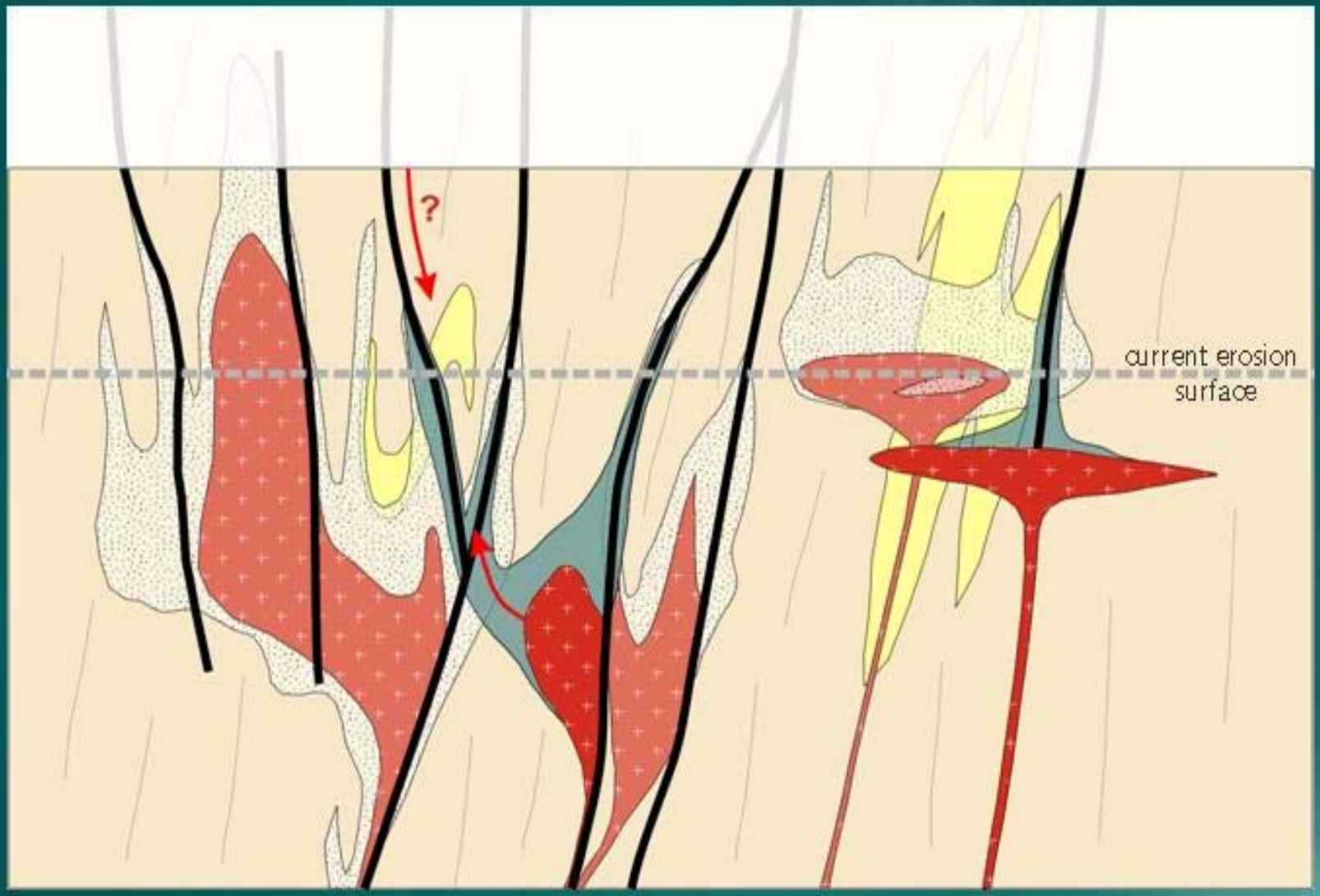


⇒ A progression to higher crustal levels, lower T, and higher fO_2

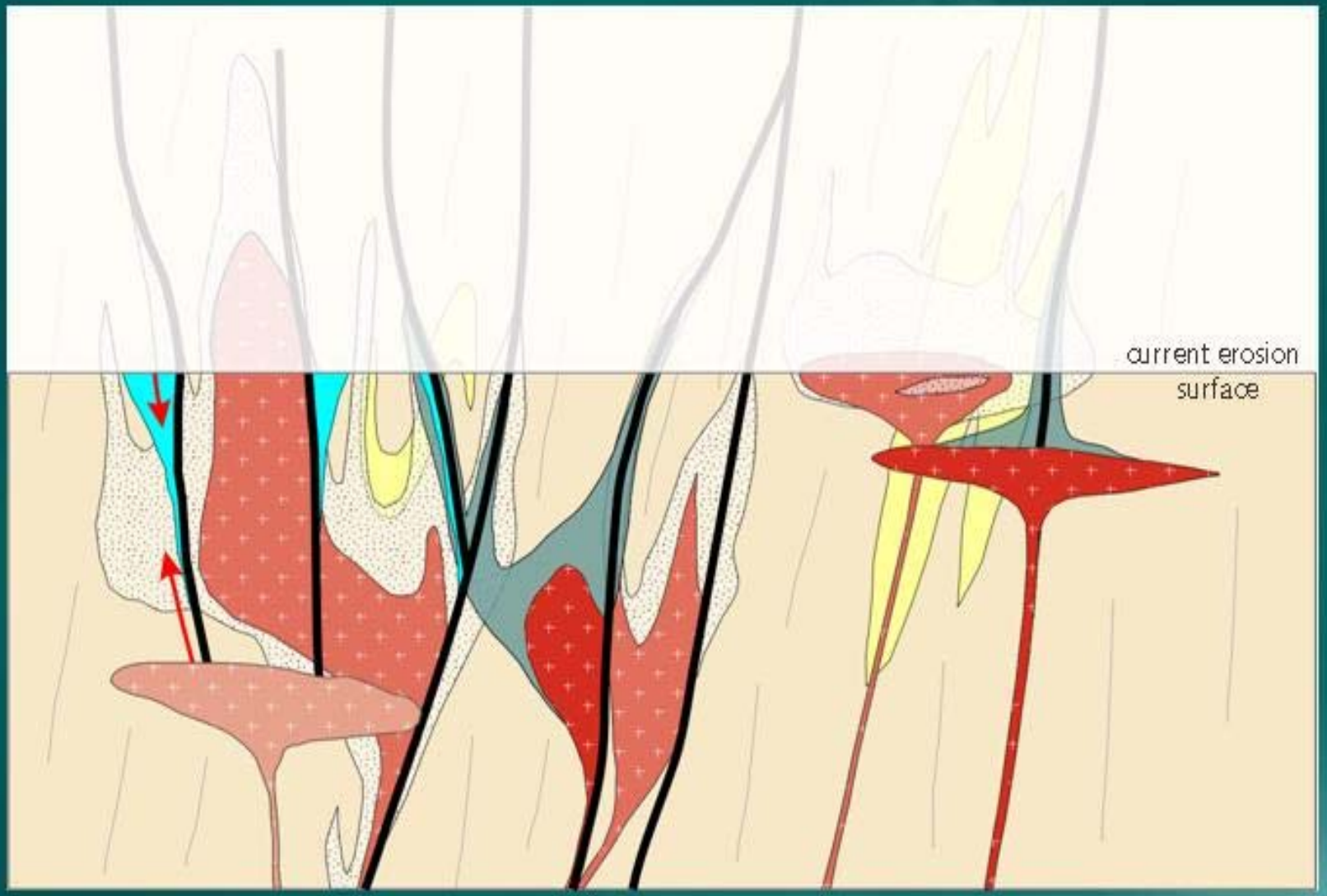
Stage 1 - High temperature CAM and BM alteration of Wallaroo Group around Hiltaba granites

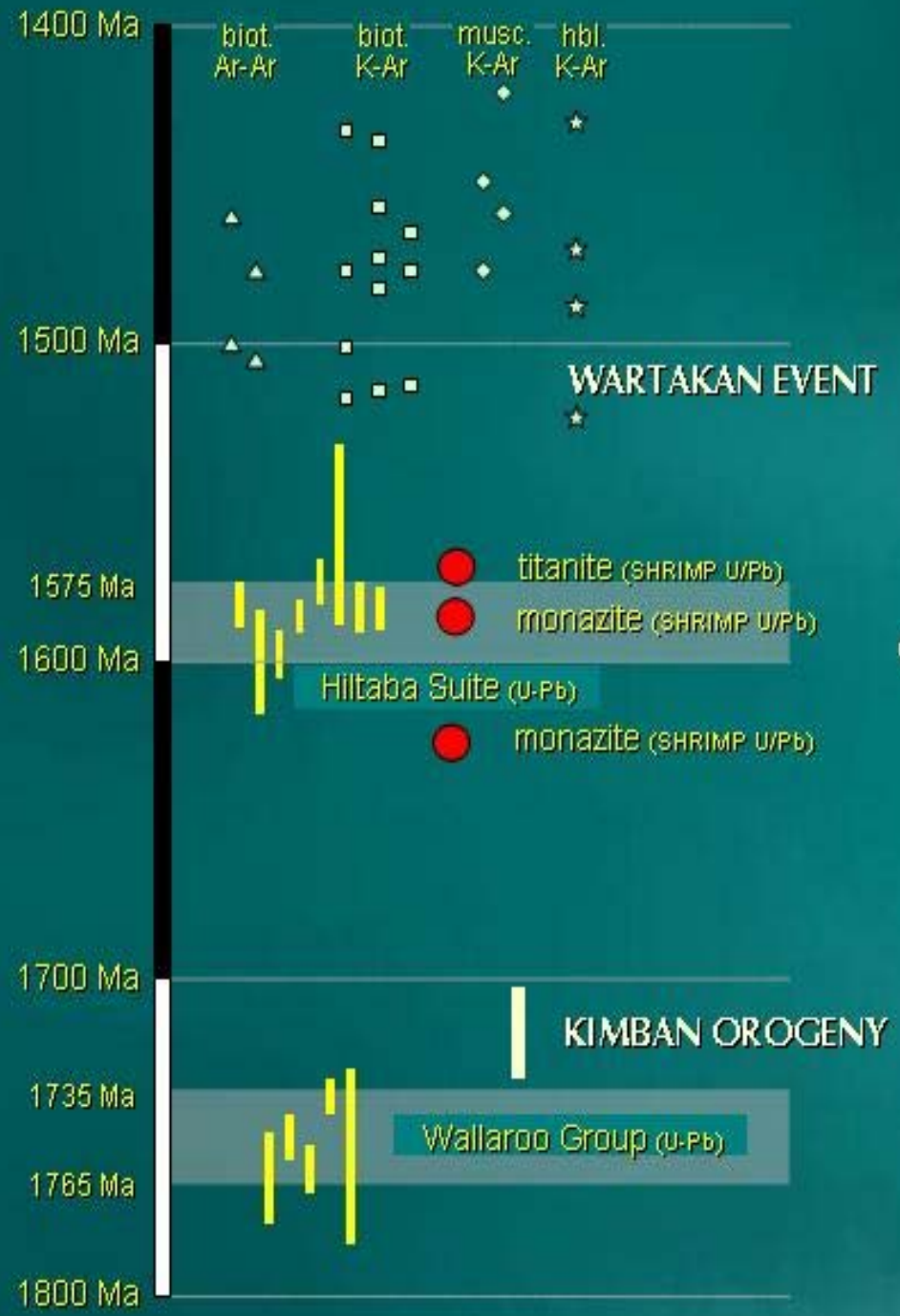


Stage 2 - Demagnetising hematite-bearing alteration with copper along structures



Stage 3 - Near surface epithermal alteration





Regional Alteration Geochronology

- Dated alteration minerals are from the early, high T assemblages
- No time constraints on later alteration events

Telescoped alteration systems

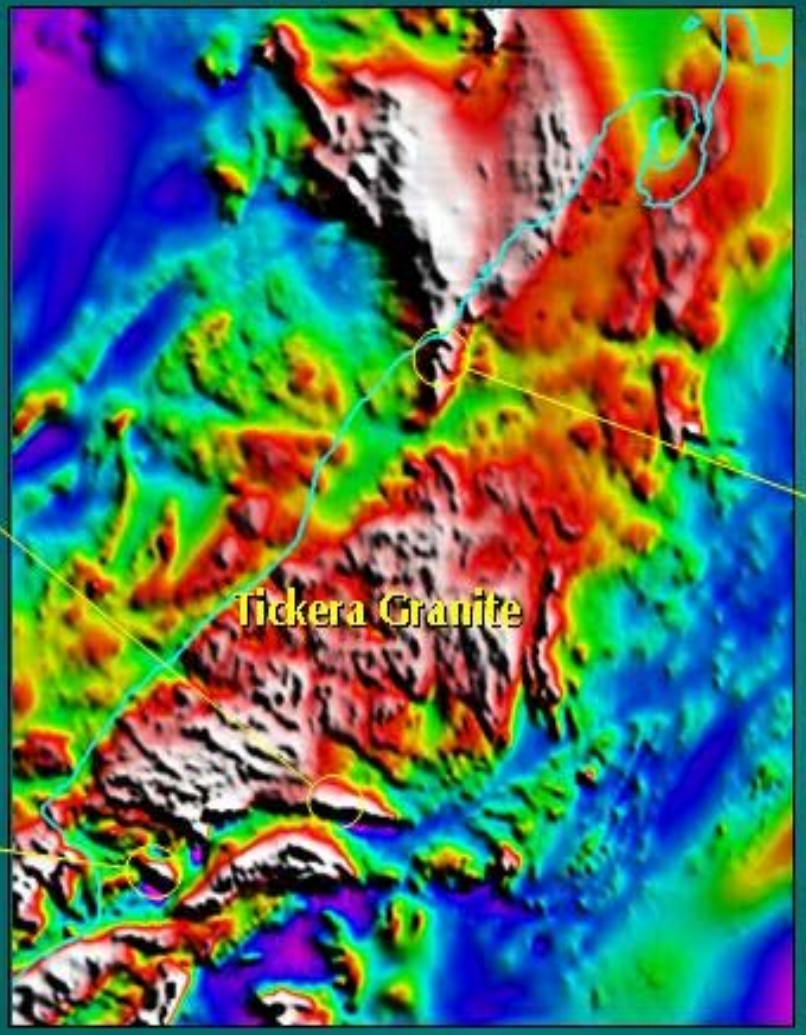
Part 1.

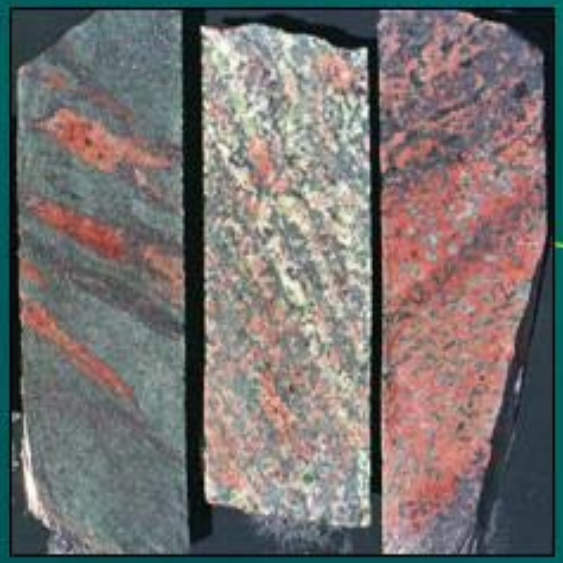
Calcsilicate - Albite - Magnetite (CAM) alteration

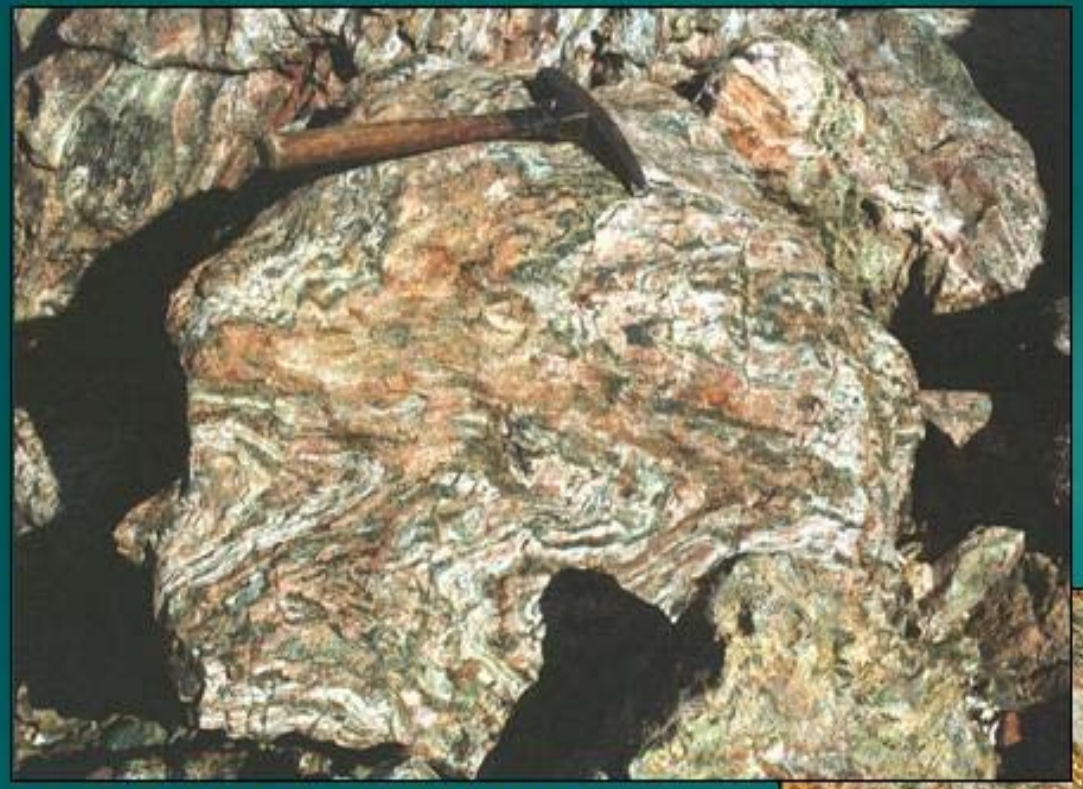
- albite-, magnetite-, and actinolite/cpx-dominant variants
- ± epidote, titanite, allanite (REE epidote), tourmaline, calcite
- veins, massive replacement, pseudobreccias
- typically proximal to granites
- no sulphides

Calcsilicate - Albite - Magnetite (CAM) alteration

- geophysical signature







North Beach, near Wallaroo,
Yorke Peninsula

Regional spatial association of CAM metasomatism with Cu-Au mineralisation is typical of the Cloncurry Belt

...but not directly related to Cu-Au mineralisation

Mt Fort Constantine,
near Ernest Henry,
Cloncurry Belt

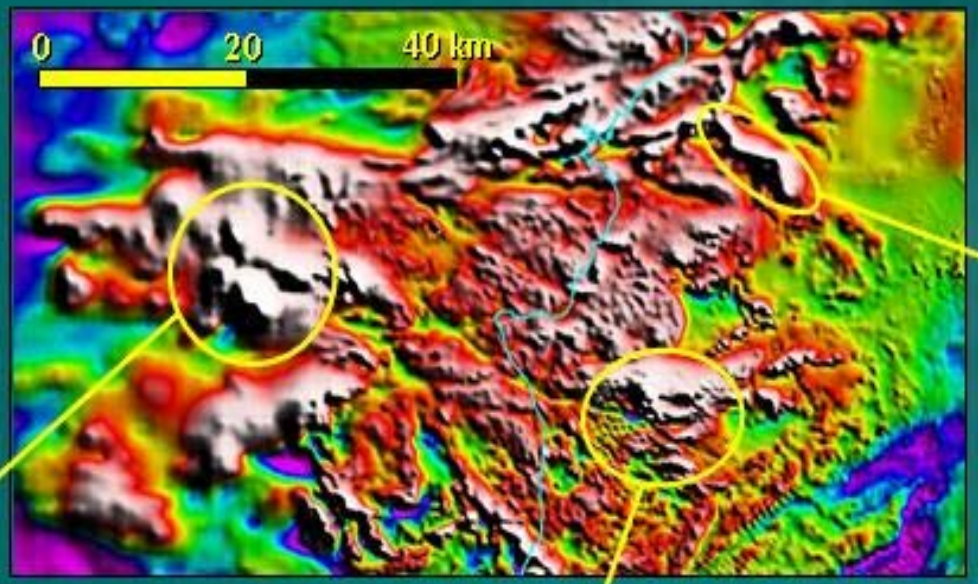
Biotite - magnetite alteration

- ± albite, quartz, apatite, monazite, tourmaline, amphibole
- pyrite, minor chalcopyrite
- strongly foliated biotite-magnetite schists; shear zones
- vein networks in more competant, weakly foliated rocks
- broad regions of magnetic alteration (10's of km)

Biotite - magnetite alteration

- geophysical signature

King George

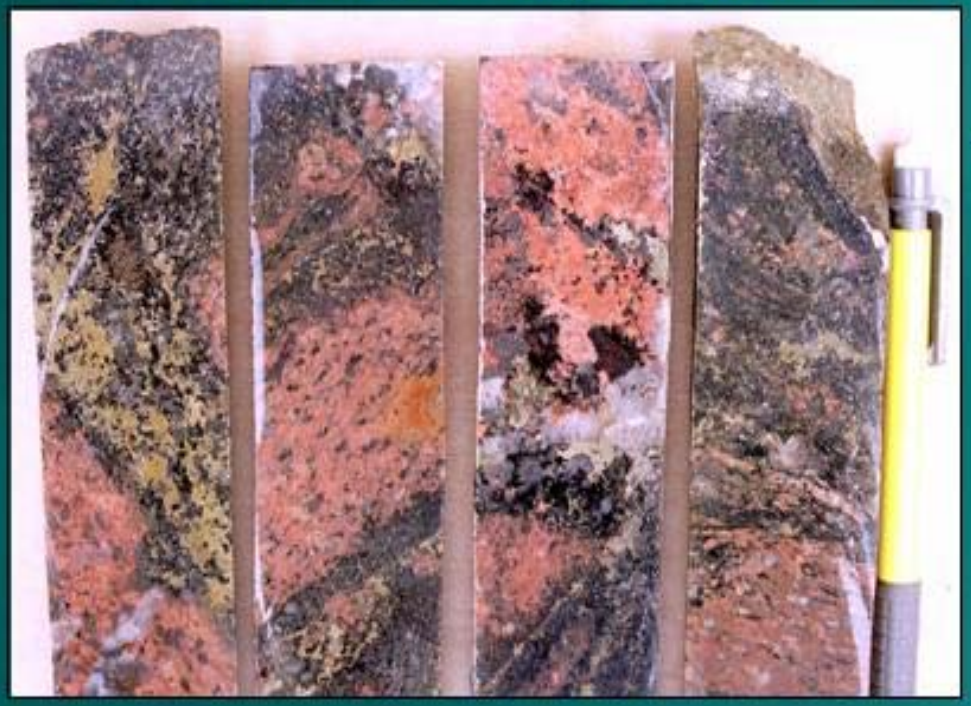


Weetulta

Doora

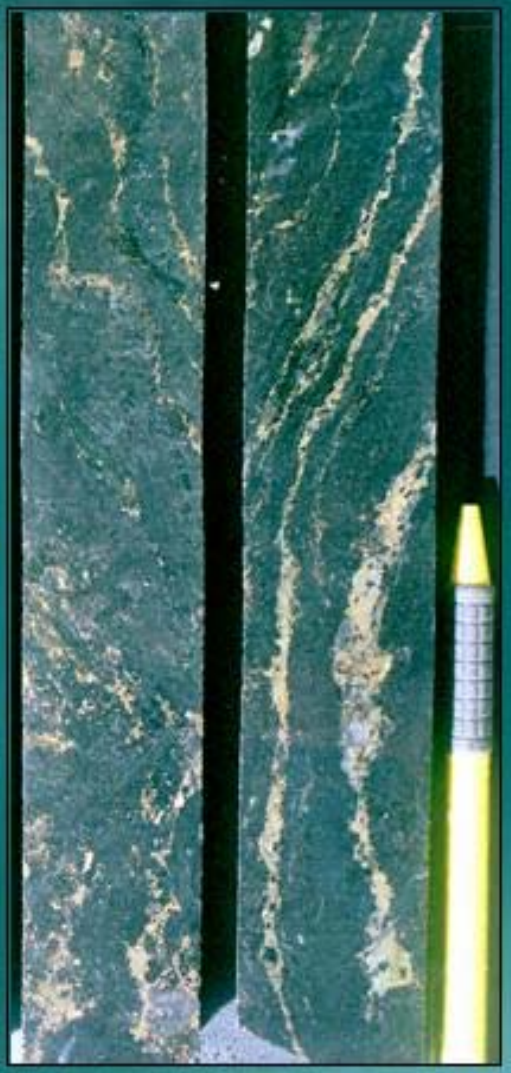
Biotite - magnetite alteration

May contain low grade copper mineralisation



Weetulta

Doora



Biotite - magnetite schist host to unmagnetic Wallaroo-style mineralisation (170 m @ 0.5% Cu)

Telescoped alteration systems

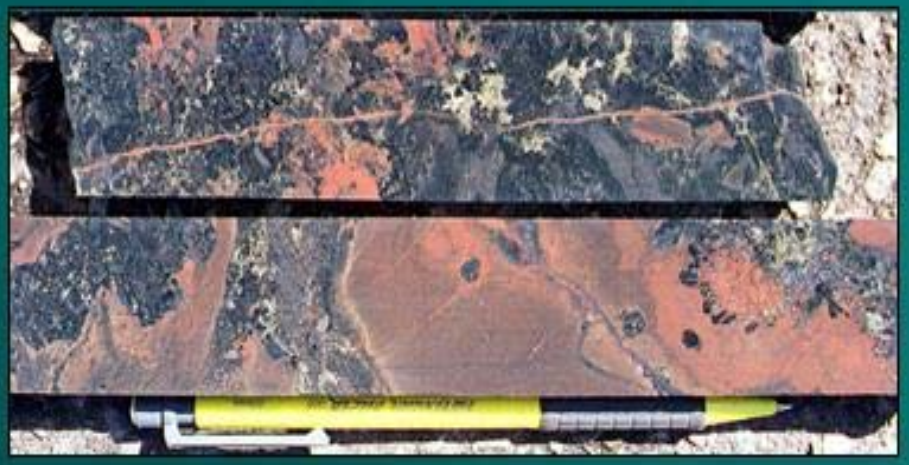
Part 2.

Non-magnetic alteration overprints

- relatively poorly represented in drilling
- ductile to brittle structures; a move to higher crustal levels
- more oxidised, lower temperature alteration
- locally associated with significant Cu mineralisation
- link to Olympic Dam - Prominent Hill style mineralisation

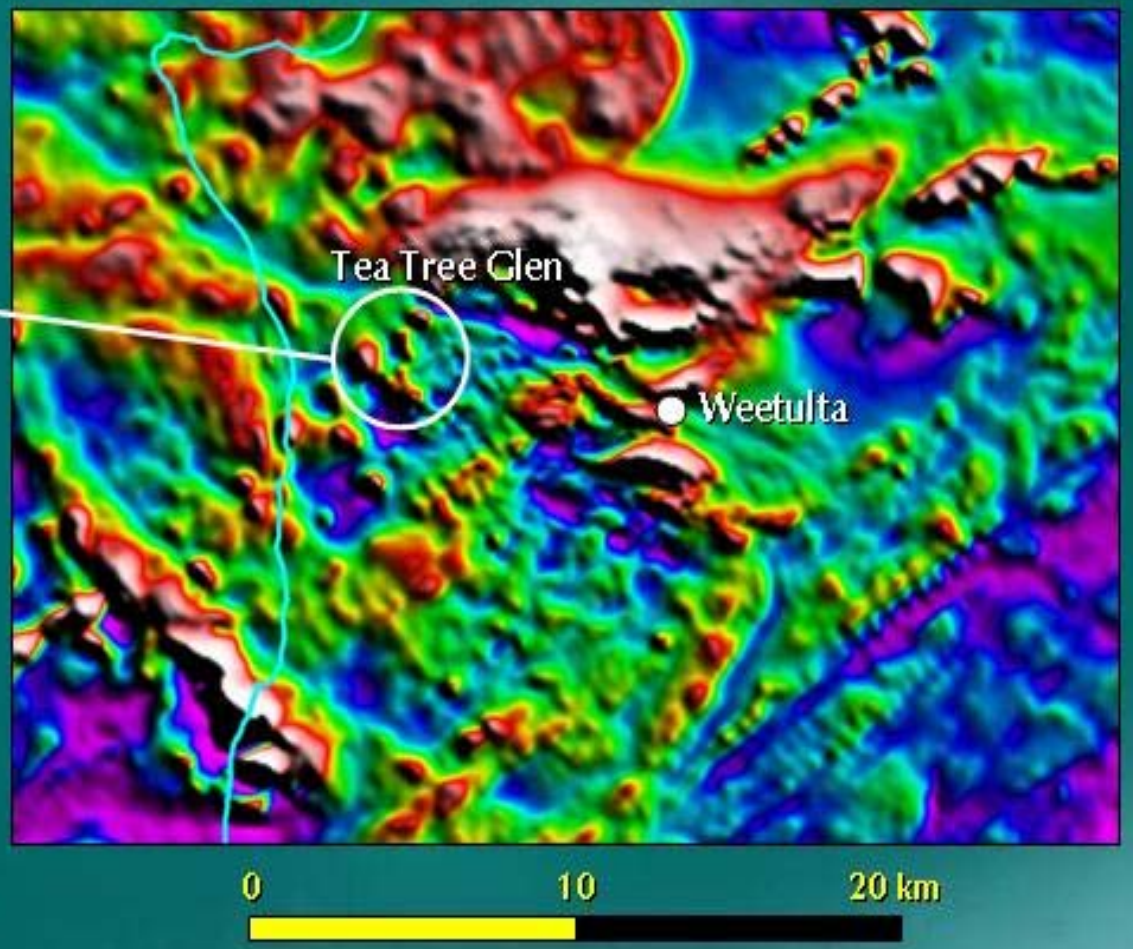
Non-magnetic alteration overprints

- Chlorite - quartz ± hematite ± kfeldspar (± sericite ± tourmaline)
  - with pyrite, and commonly chalcopyrite
  - locally associated with significant Cu mineralisation (eg: Moonta and Wallaroo)



Weetulta

Chloritic alteration with copper mineralisation associated with demagnetisation of earlier magnetic alteration



Non-magnetic alteration overprints

Epithermal style alteration

- Kaolinite - quartz

  ± pyrite, alunite, chalcocite

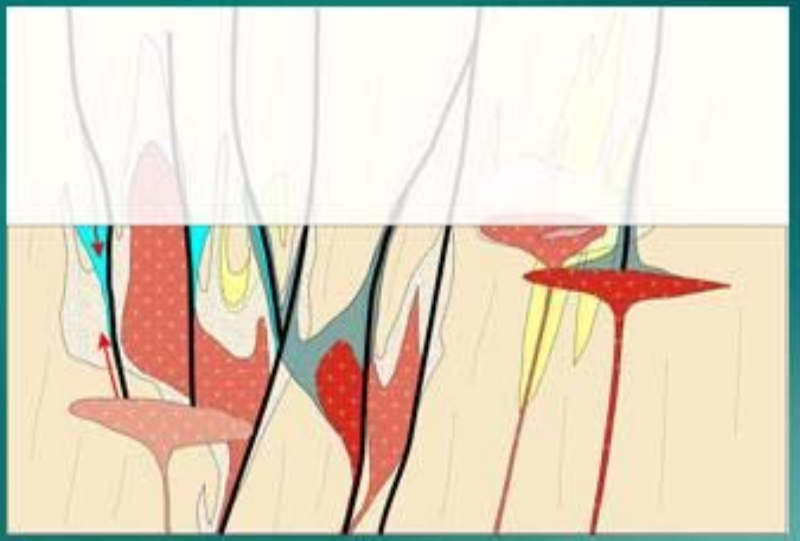
  local remobilisation of earlier mineralisation

- Quartz - carbonate - hematite

  ± pyrite, chalcopyrite,

  chalcocite, bornite

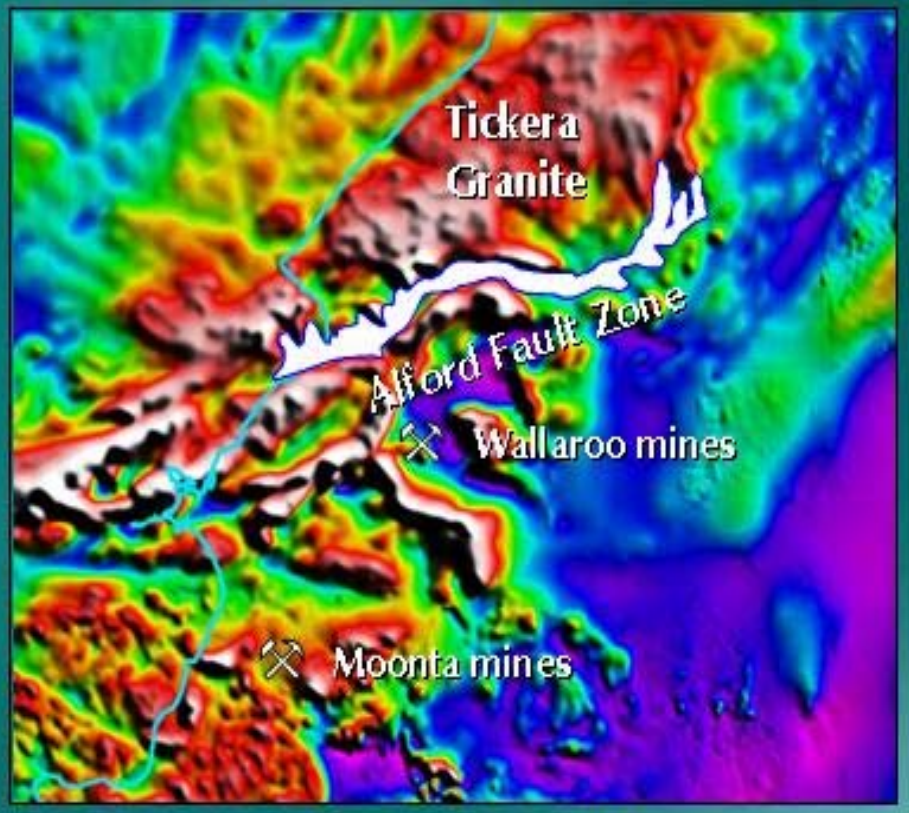
  local Cu mineralisation



Kaolinite - quartz
(± pyrite, alunite, chalcocite)

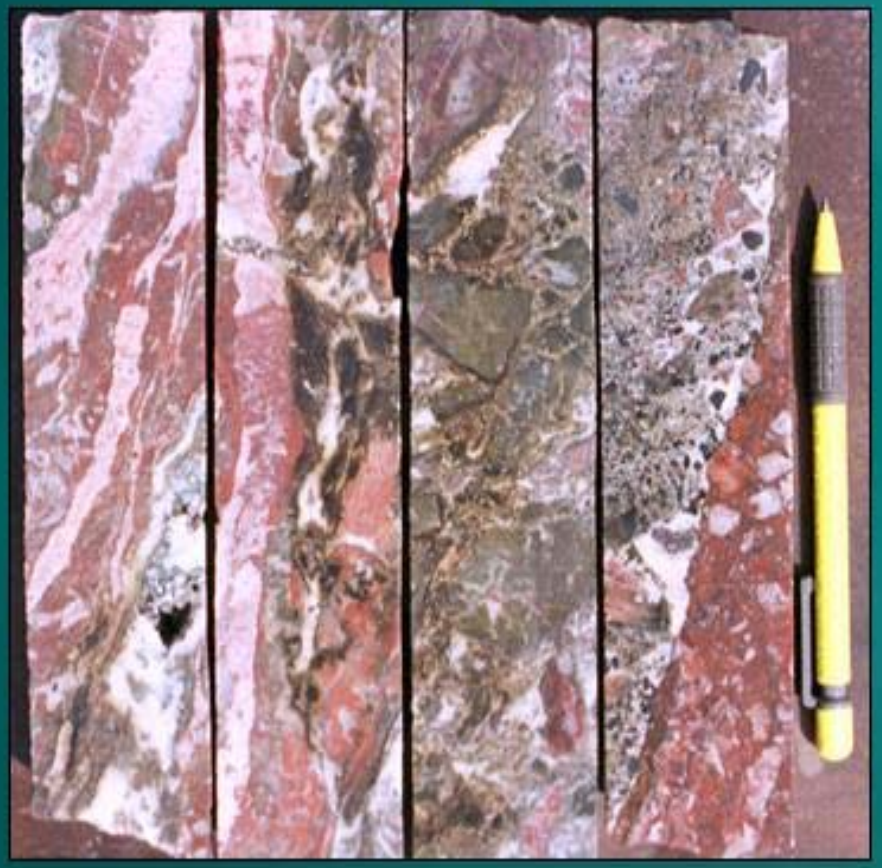
Alford Fault Zone

Wheal Hughes, Moonta



Quartz - carbonate - hematite
(± pyrite, chalcopyrite, chalcocite, bornite)

Katinka prospect

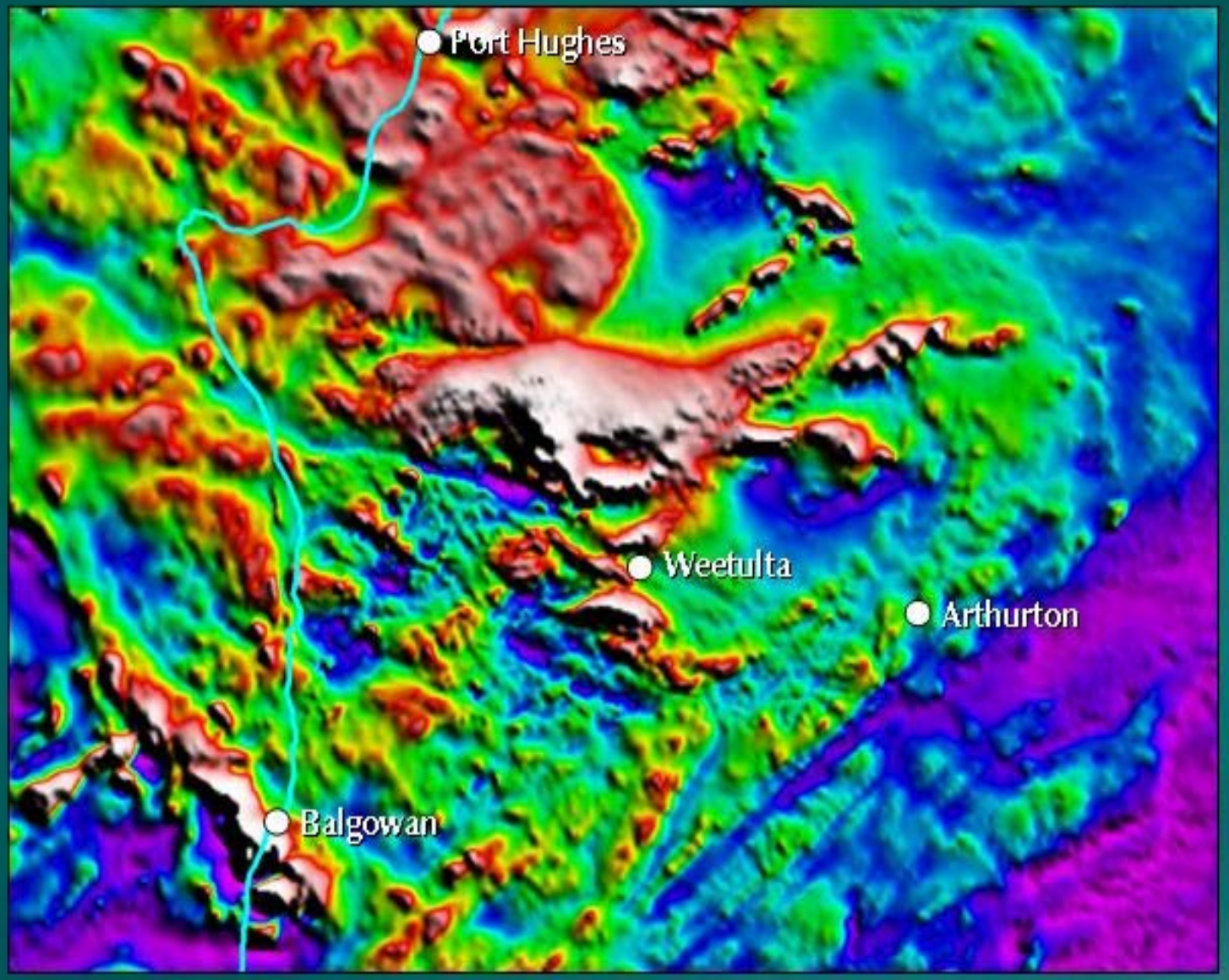


A question to ponder

Are the non-magnetic alteration assemblages really spatially restricted ...

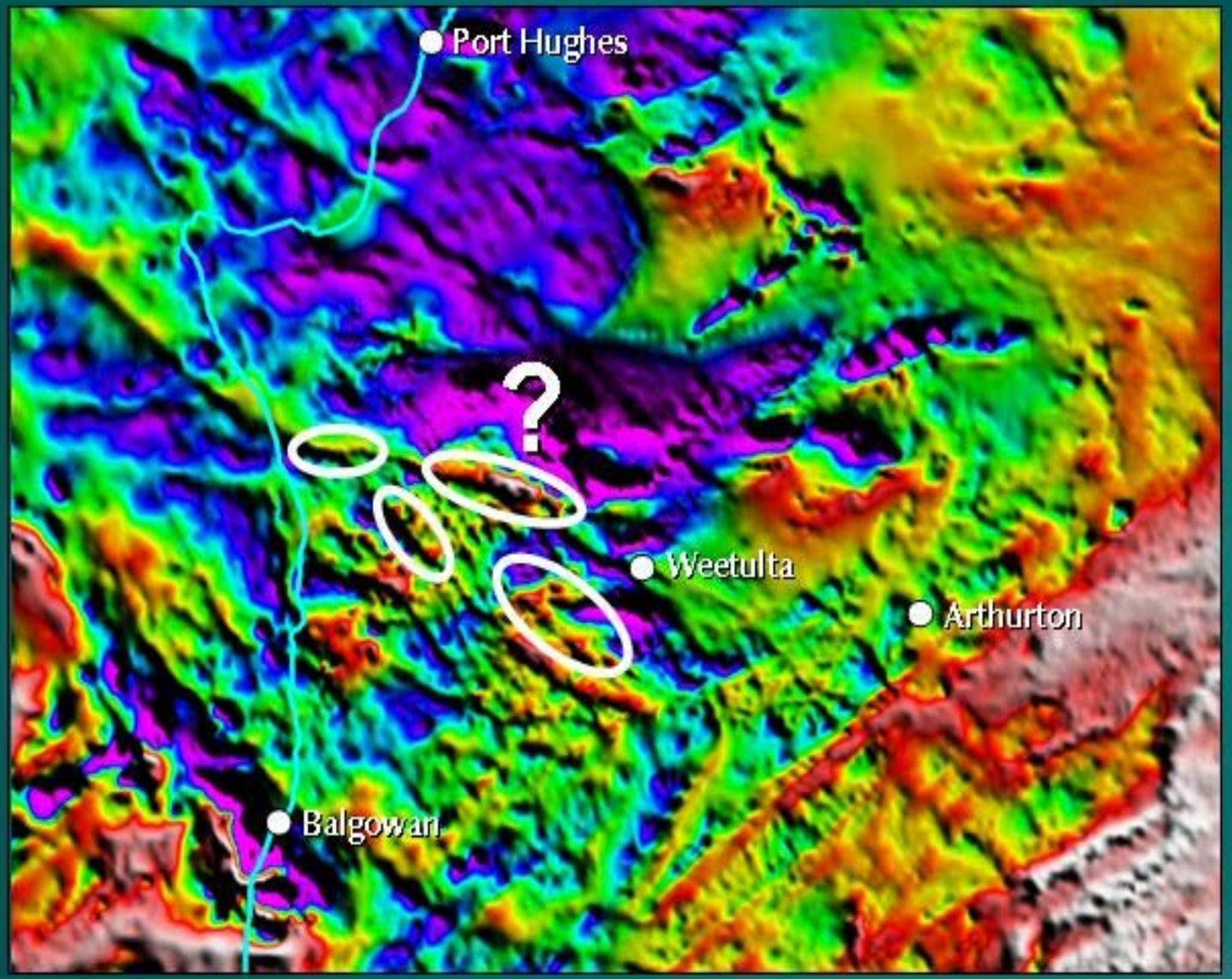
... or are they just under-represented in drilling due to historical targeting of magnetic highs ?

Perhaps we need to look at the magnetics differently from the past...



Demagnetised zones in favourable structural settings

⇒ oxidised, chloritic alteration and Cu-Au mineralisation



Summary

- Potential for Cloncurry Belt style Cu-Au mineralisation associated with magnetite-biotite alteration

- Potential of Olympic Dam/Prominent Hill style Cu-Au mineralisation associated with more oxidised, chloritic alteration
  - demagnetisation of pre-existing magnetite bodies in favourable structural settings

- Epithermal textures indicate late hydrothermal activity at high crustal levels ⇒ progression to Olympic Dam crustal levels?

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