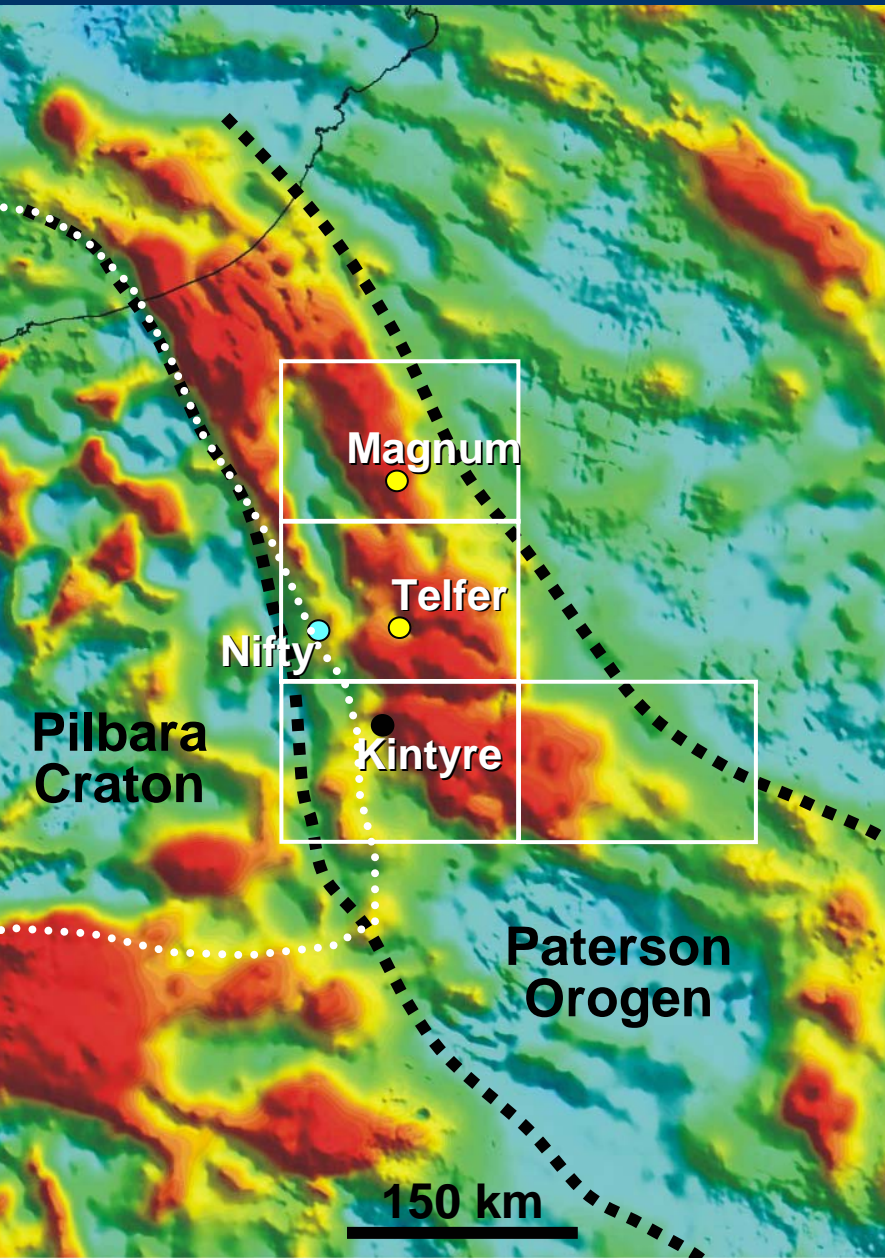


# Proterozoic geology of the northwest Paterson Orogen, Western Australia: Prospectivity, possibilities, progress, and the Permian problem

*Avon McIntyre, Leon Bagas, Kevin Cassidy, Karol Czarnota, David Huston,  
Tony Meixner, David Maidment, Narelle Neumann, Anna Potter.*

# NGA Paterson Project

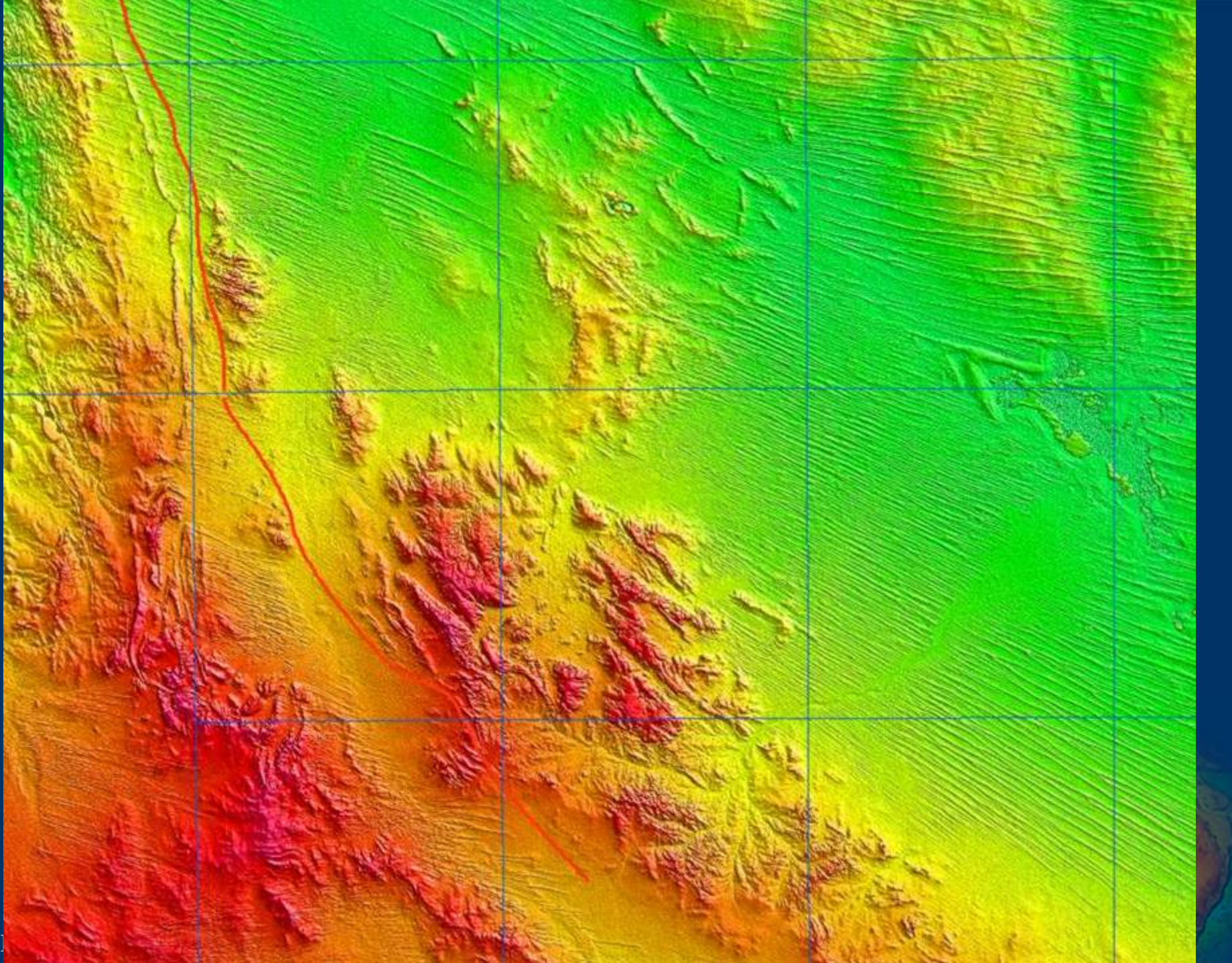


- Paterson Orogen: Paleo- to Neo-proterozoic metasedimentary-volcanic rocks and felsic-mafic magmatism
- Mineral systems: Au-Cu (Telfer, Magnum), Cu-Zn-Pb (Nifty, Maroochydore), U (Kintyre)
- limited understanding of basin formation, deformation & magmatism
- mainly covered by Canning Basin and Cainozoic sediments

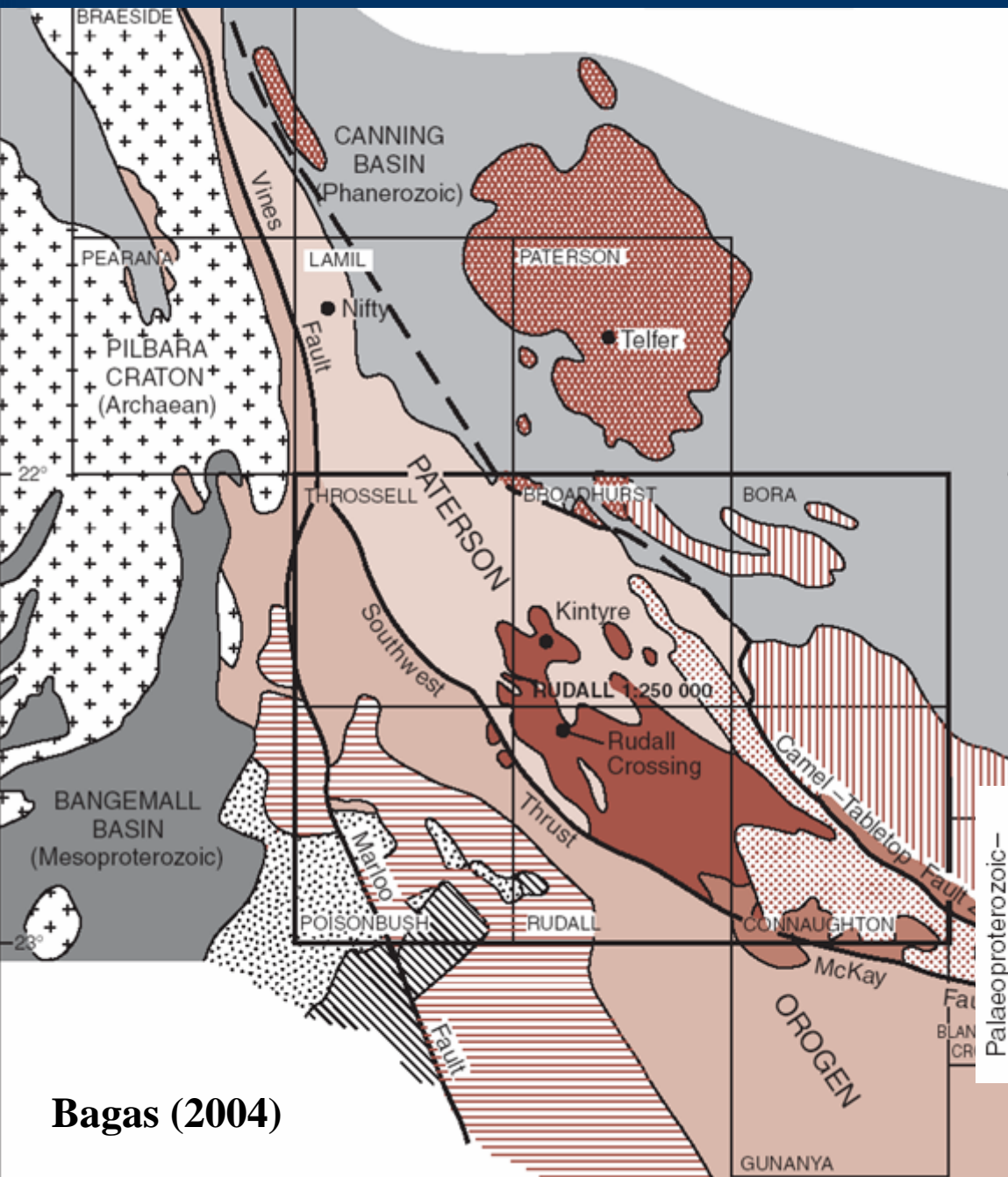
**PROVIDE AN IMPROVED  
GEOLOGICAL & MINERAL SYSTEM  
FRAMEWORK**



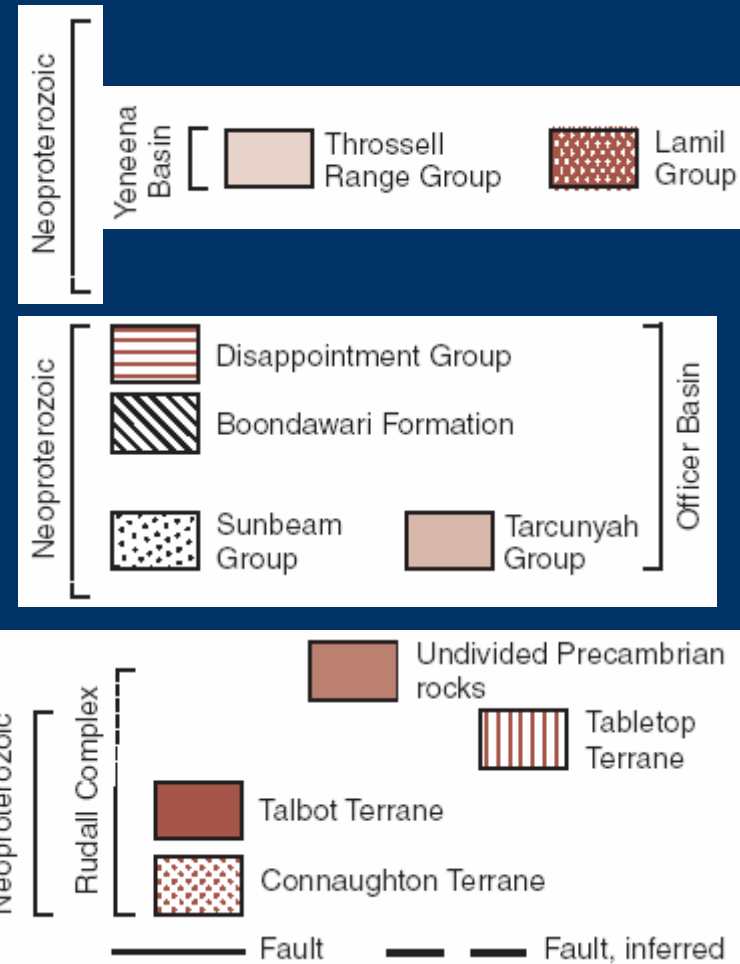
Australian Government  
Geoscience Australia

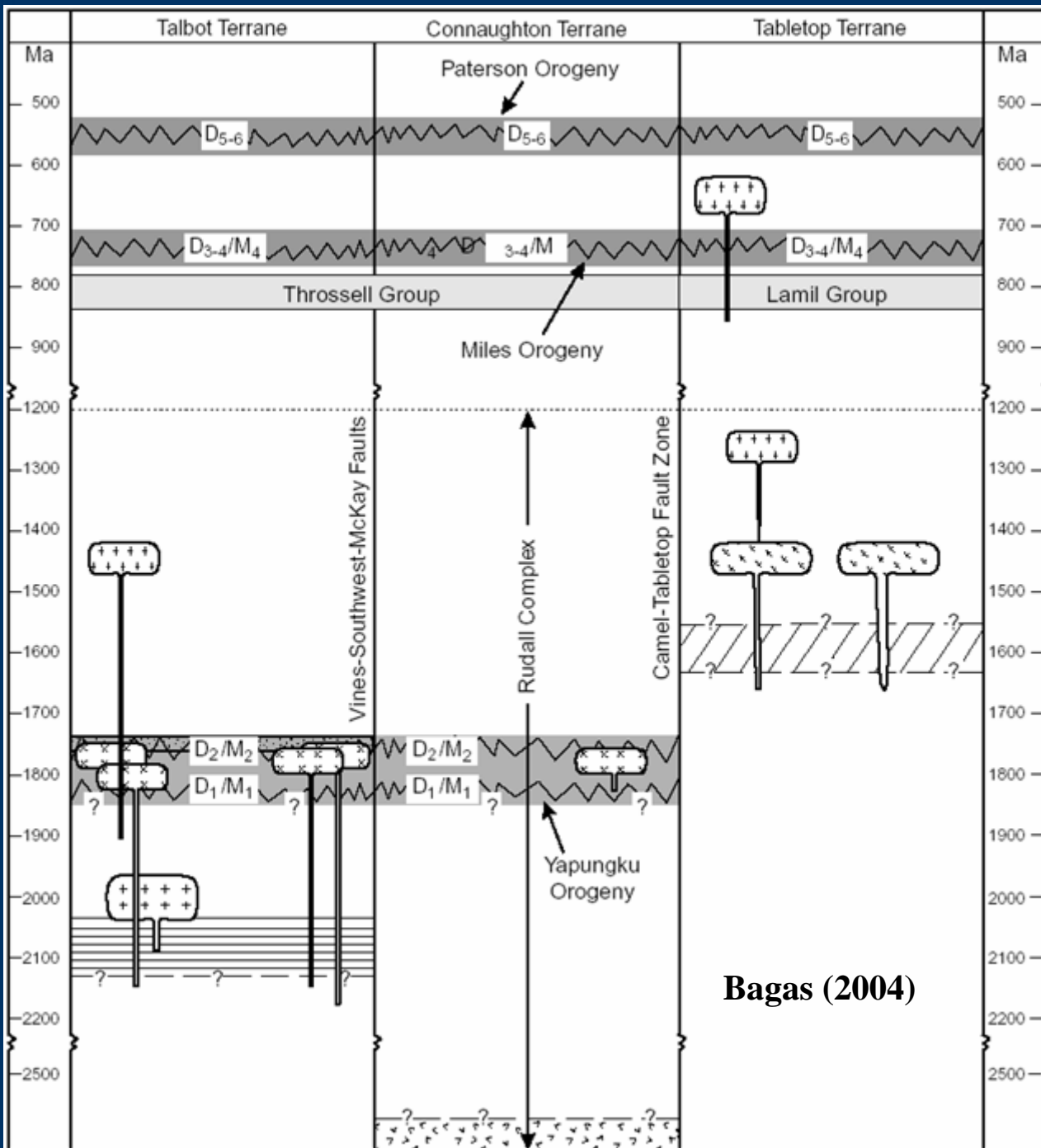


# Region

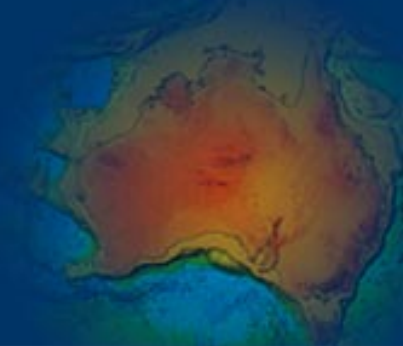


Bagas (2004)

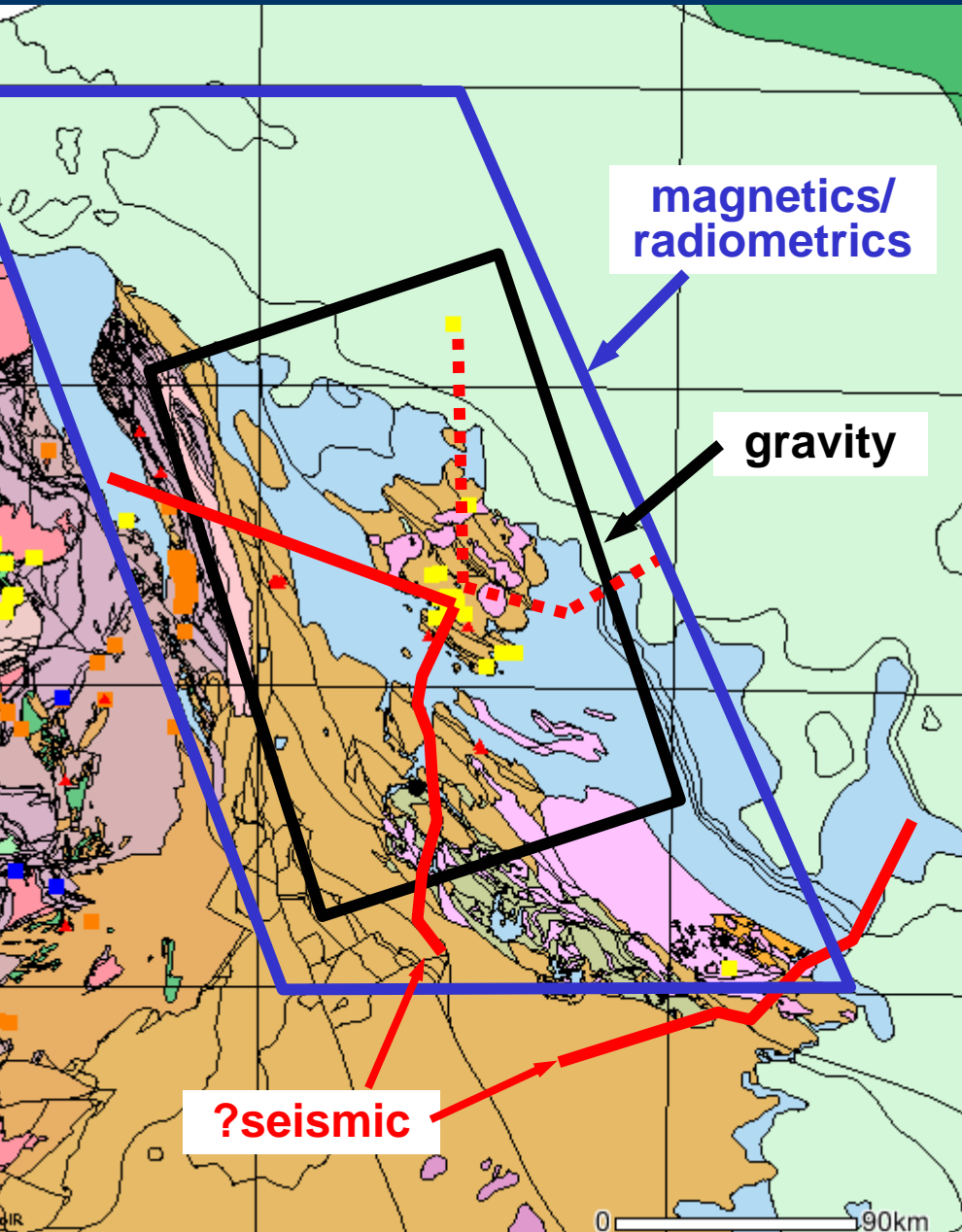




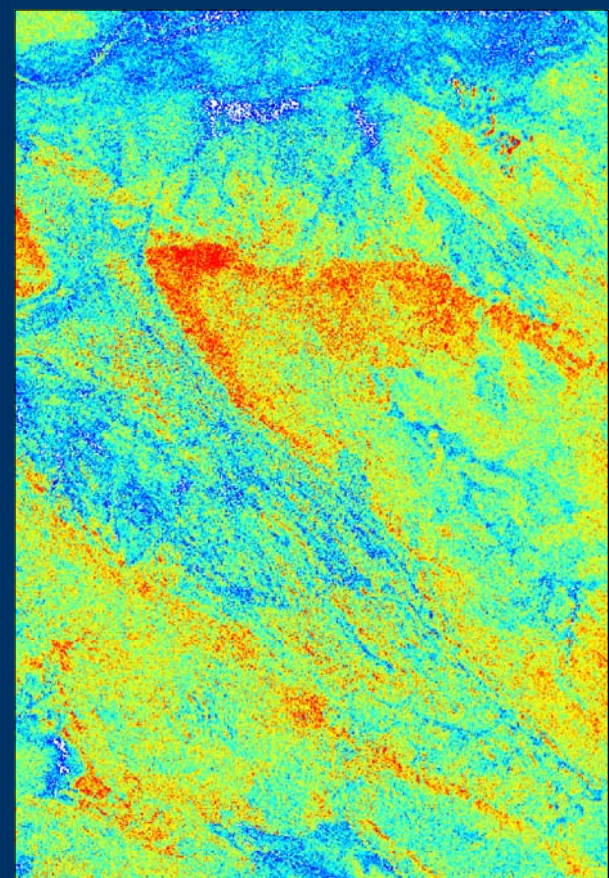
- age of sedimentation?
- age of deformation, magmatic and metamorphic histories?
- age of mineral systems w.r.t. to tectonism & magmatism?
- project to focus on Neoproterozoic
- insights into assembly of Proterozoic Australia



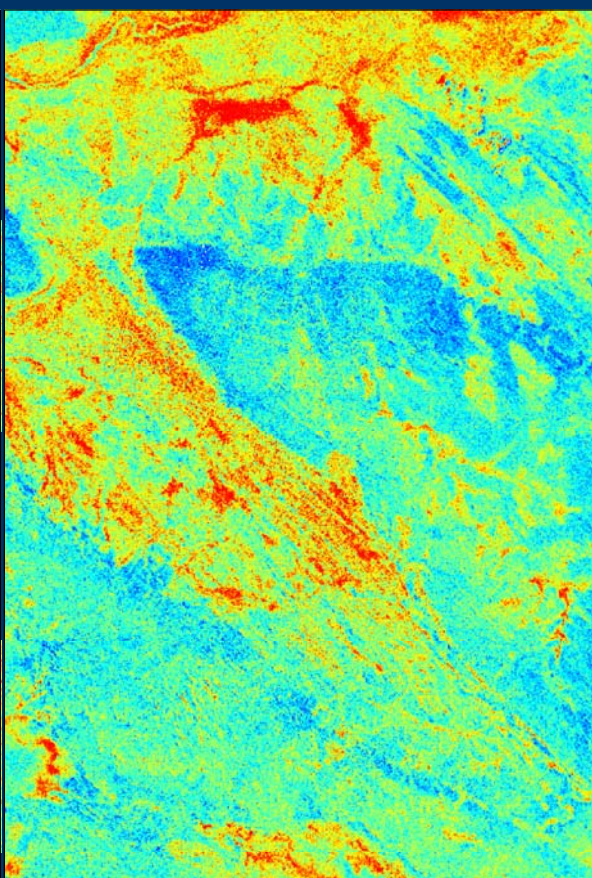
# 2005-06 program



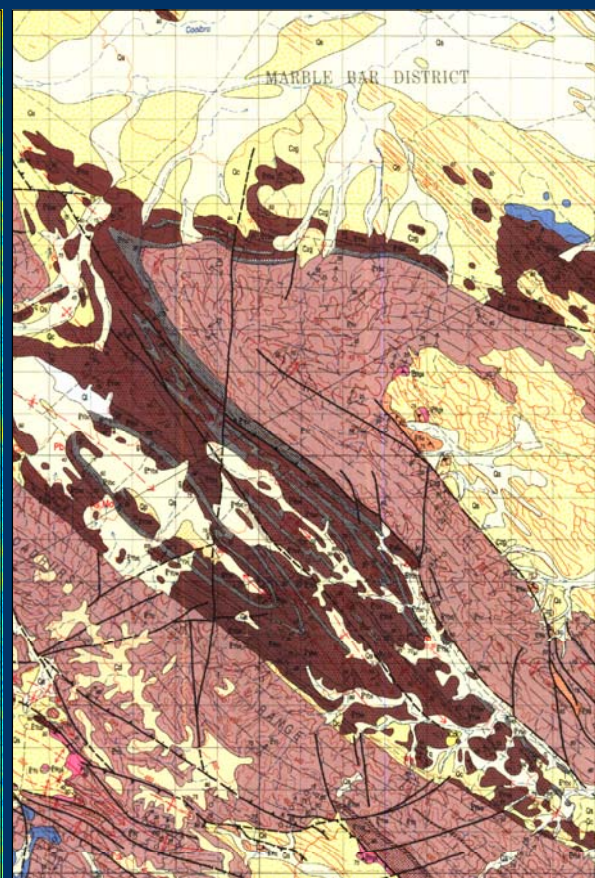
- ❖ Geophysics/remote sensed data:
  - aeromagnetics/radiometrics (400 m) [GSWA]
  - regional gravity (~2.5 x 2.5 km) [GSWA & GA]
  - hyperspectral data (ASTER)
- ❖ construct a sequence stratigraphic framework
- ❖ constrain timing and processes of basin development, magmatism, tectonism and mineral systems
- ❖ develop 3D map of region
  - 3D Geomodeller
  - gOcad (eventually)
- ❖ prepare for seismic acquisition program



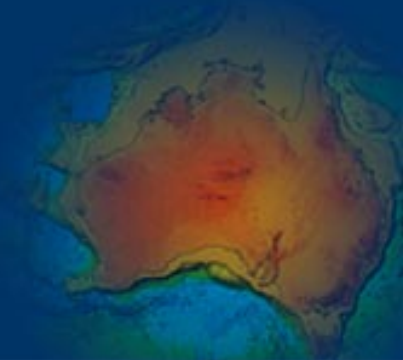
Muscovite



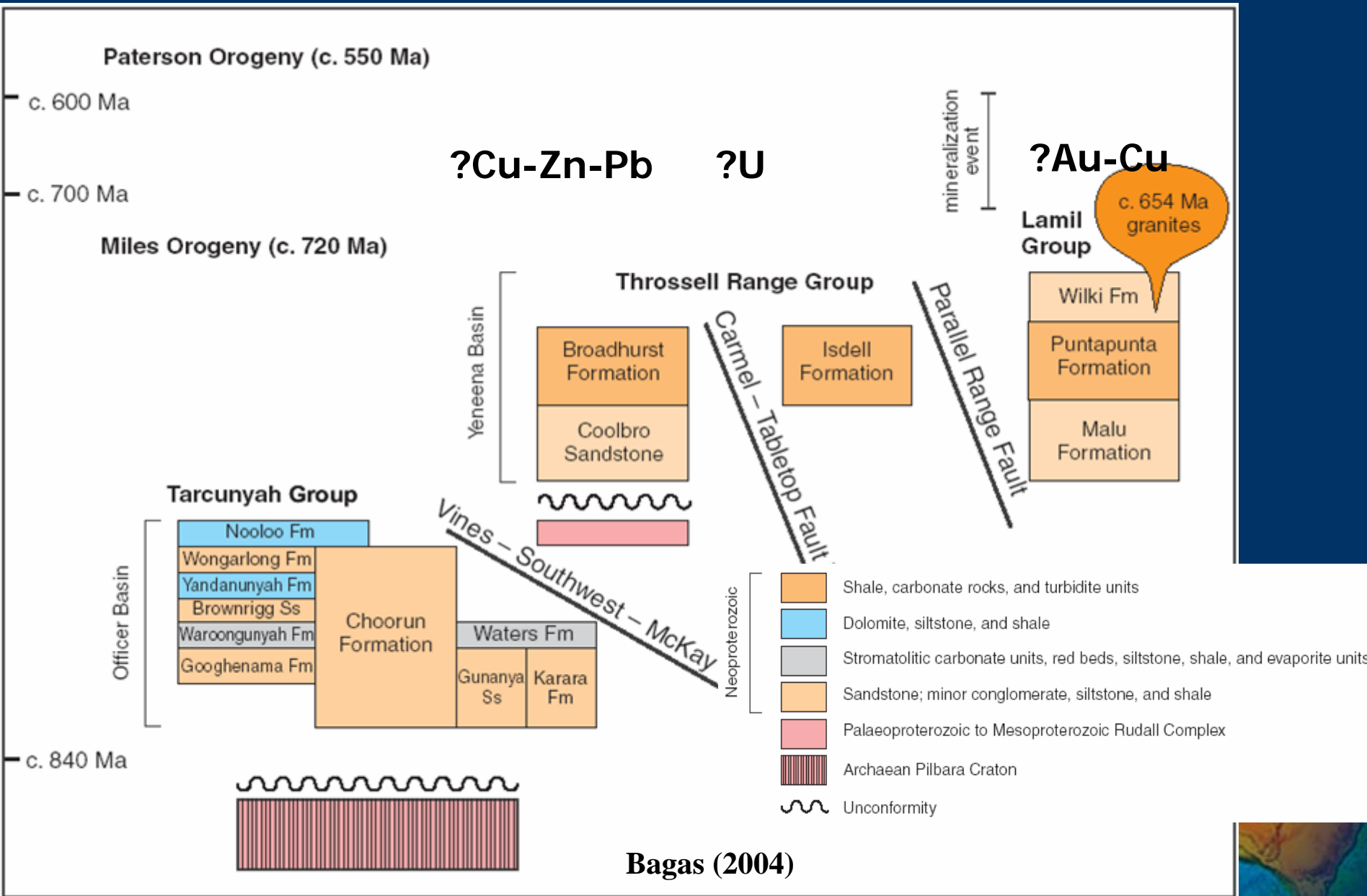
Epidote\_chlorite\_amphibole

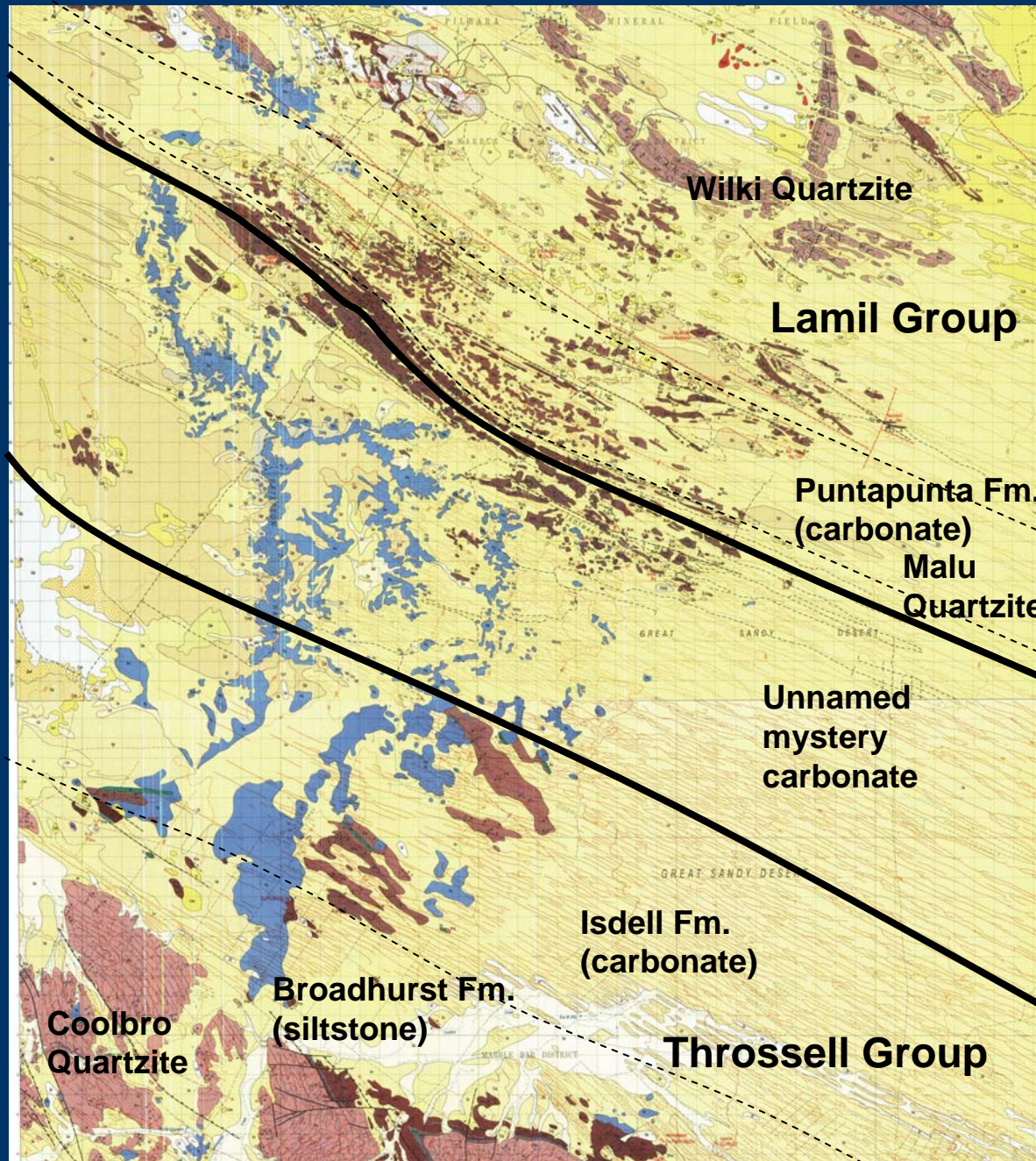


1:100,000 geology

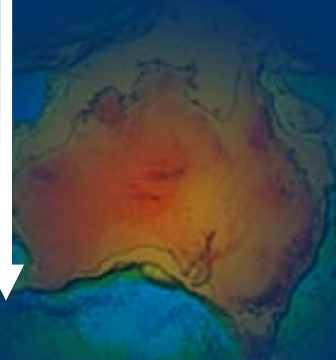


# Stratigraphy: GSWA (Bagas)

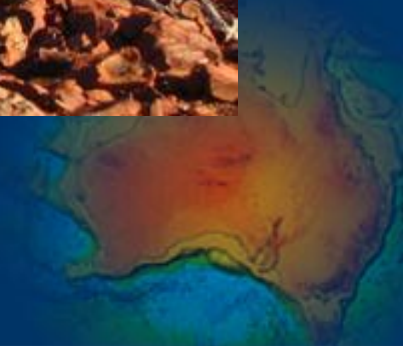


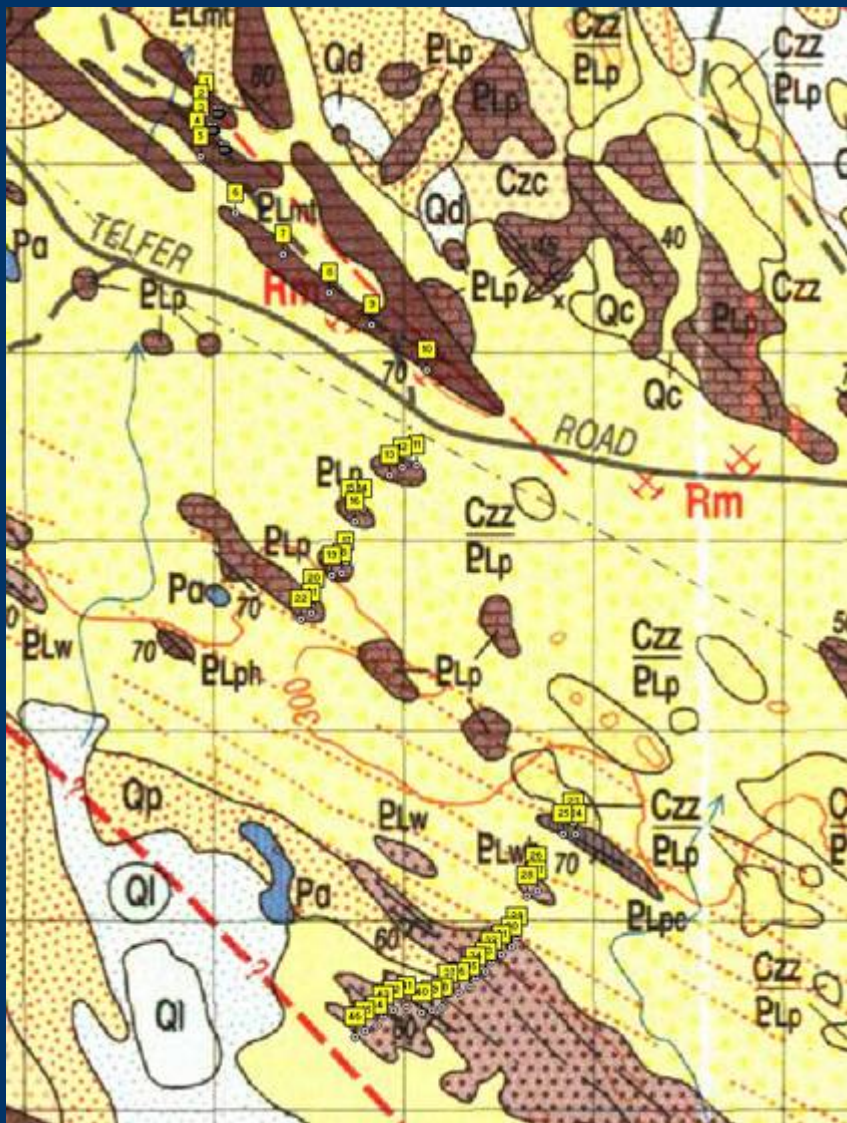


~60km



# Section logging method





**GeoTrig**

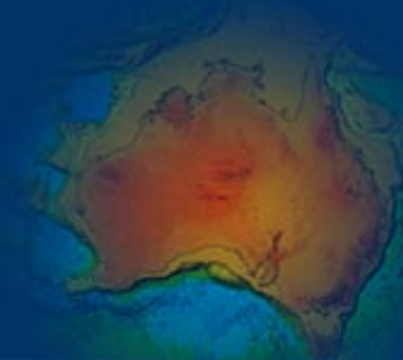
Apparent Dip	3-Point Problem	
Map Thickness (from dist)	Height	Drilled-Thickne
Vertical Exaggeration	True Dip	<b>Map Thickness (fro</b>

Point# Easting(x) Northing(y) Elevation(z) Dip Direction: 45.0  
 #1: 425673.0 7509223.0 0.0 Dip Angle: 30.0  
 #2: 425680.0 7509242.0 0.0 Thickness = **9.2**

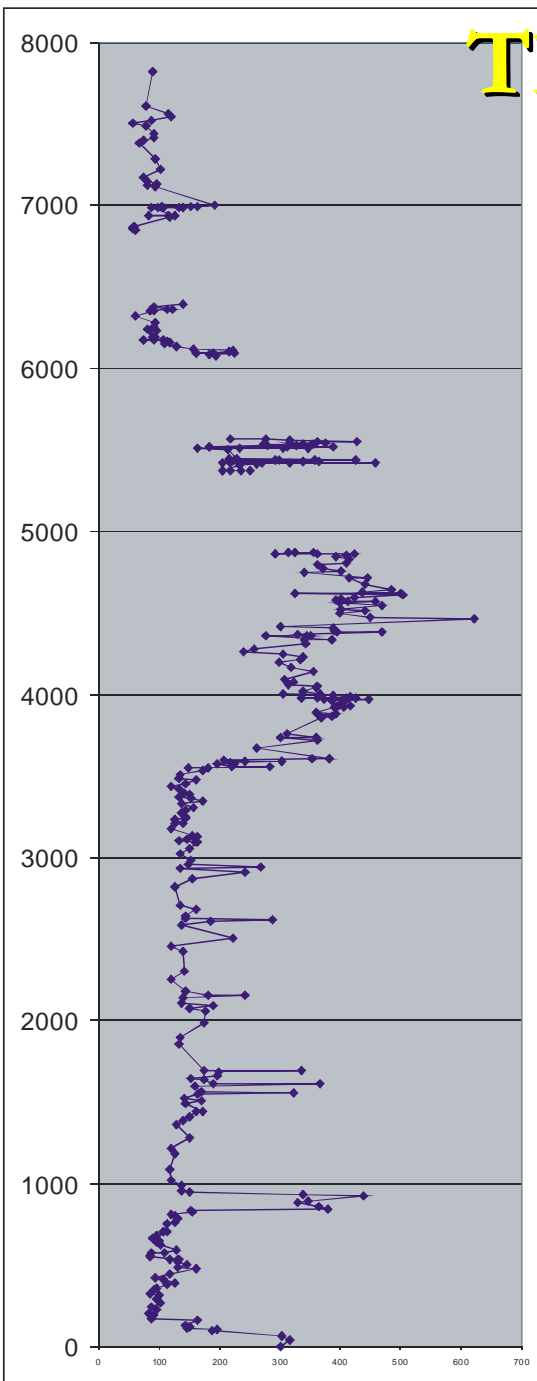
The Map Thickness program calculates the true thickness of a geologic unit based on the strike and dip of the formation and the upper and lower contacts.

Note: The dip direction and dip must be entered in degrees.

Exit



# Throssell Range Group



**Isdell  
Fm.**

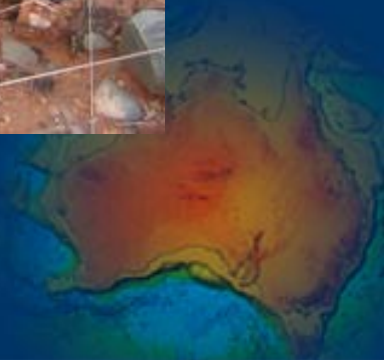
turbidites

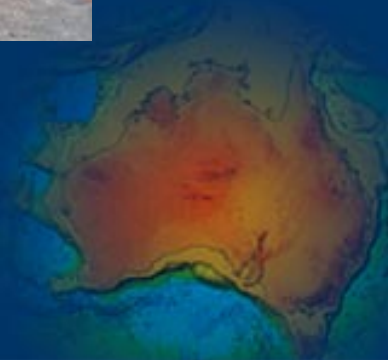
**Broadhurst  
Fm.**

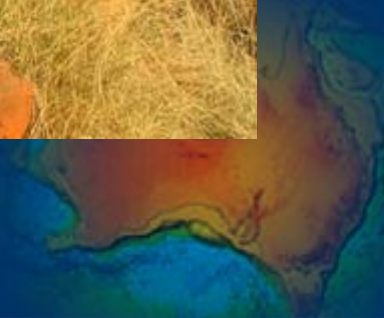
**Coolbro  
Qtzite**

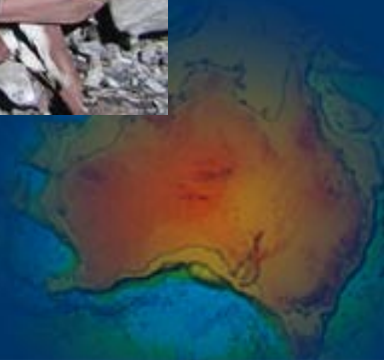
**Fining upwards,  
= Transgression**



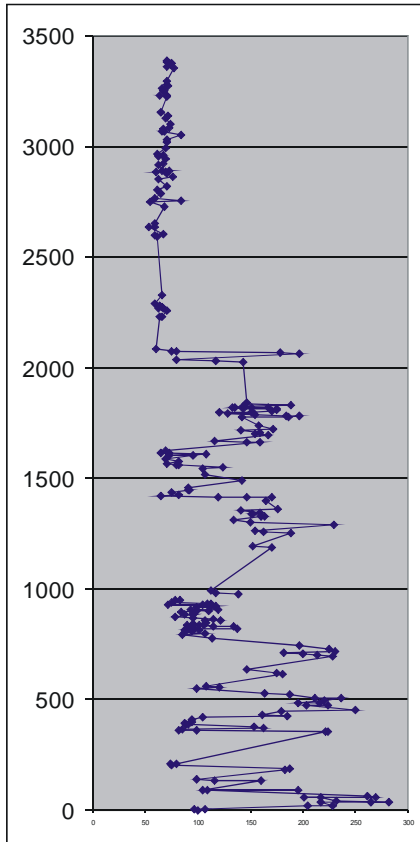








# Lamil Group

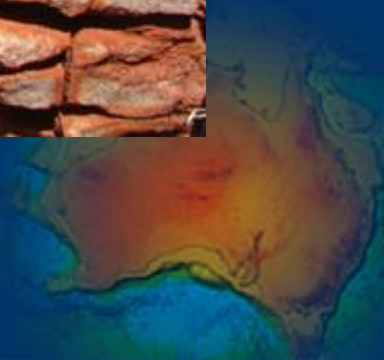


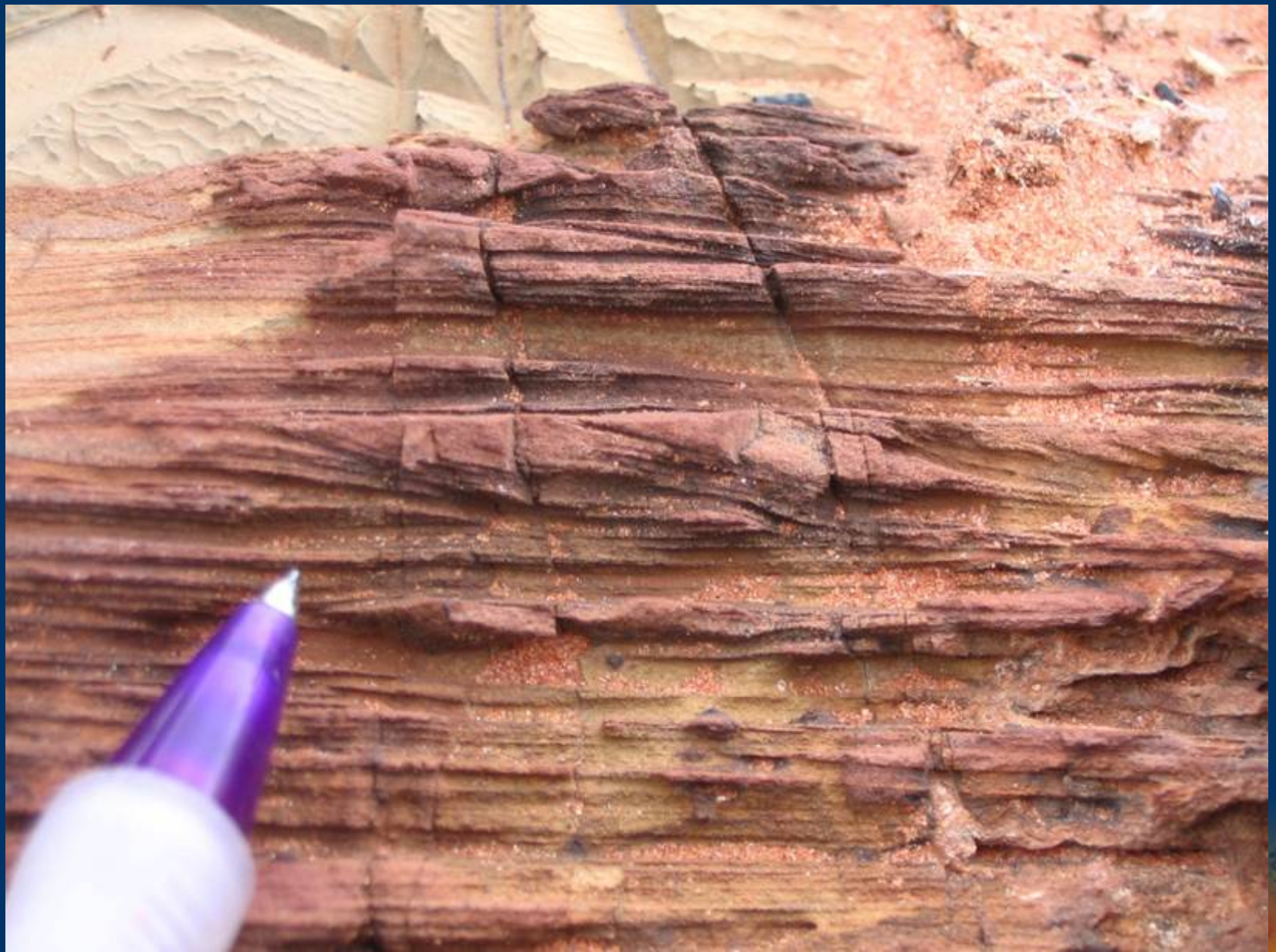
**Wilki  
Qtzite**

**Puntapunta  
Fm**

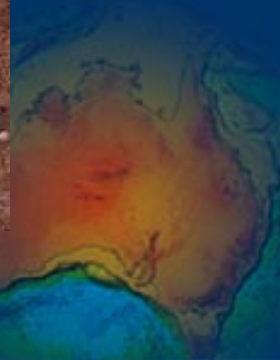
**Malu  
Qtzite(s)**

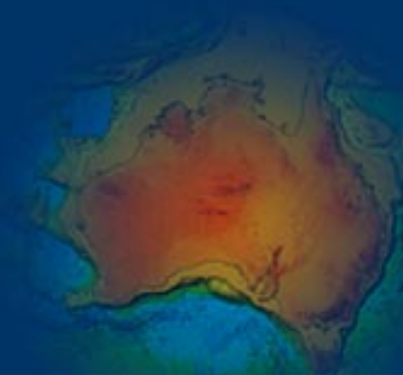
**Coarsening,  
cleaning upwards  
= Regression**

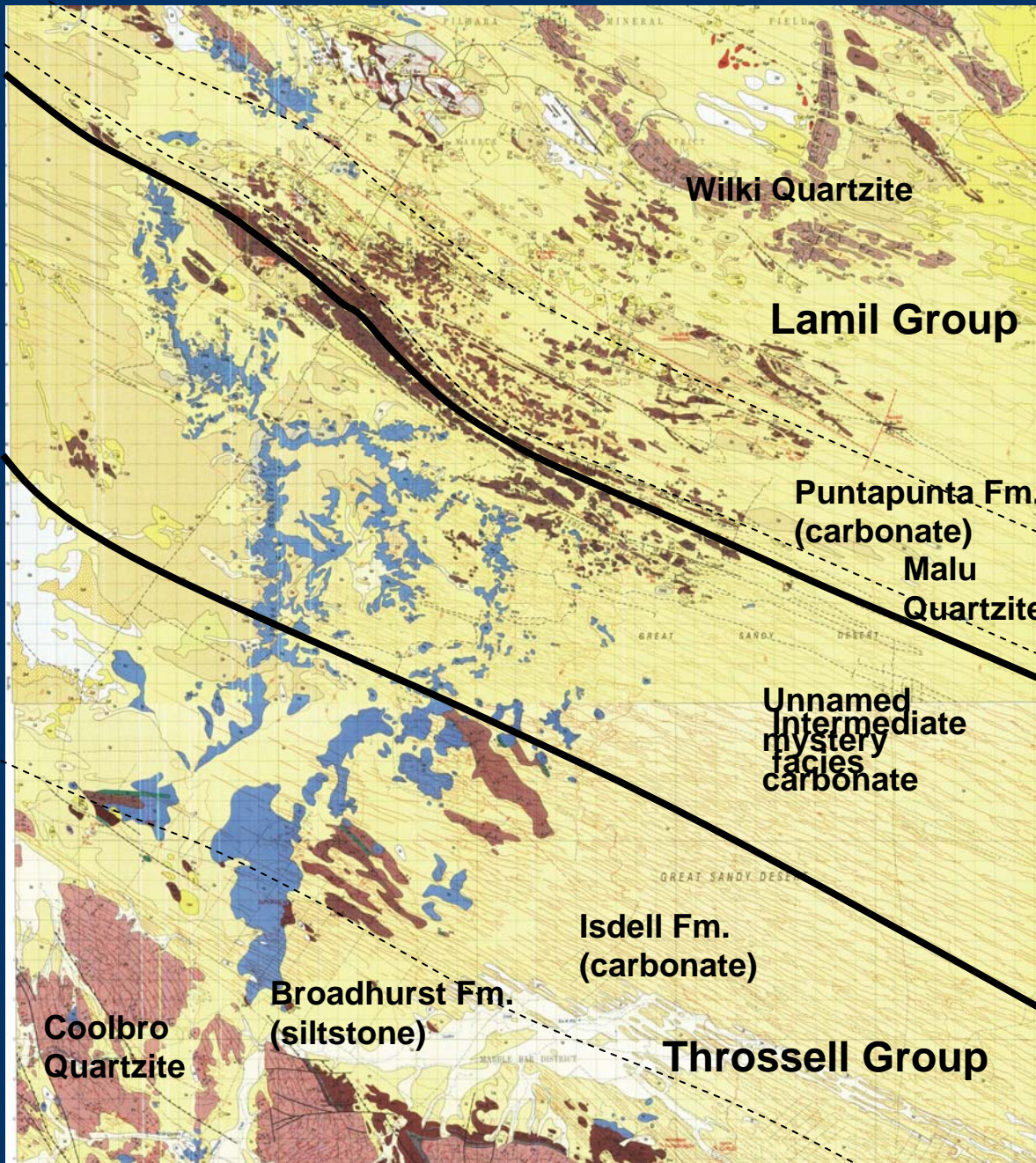




# The unnamed carbonate

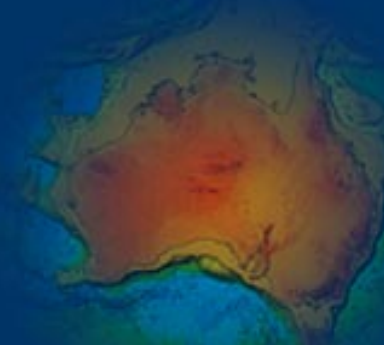




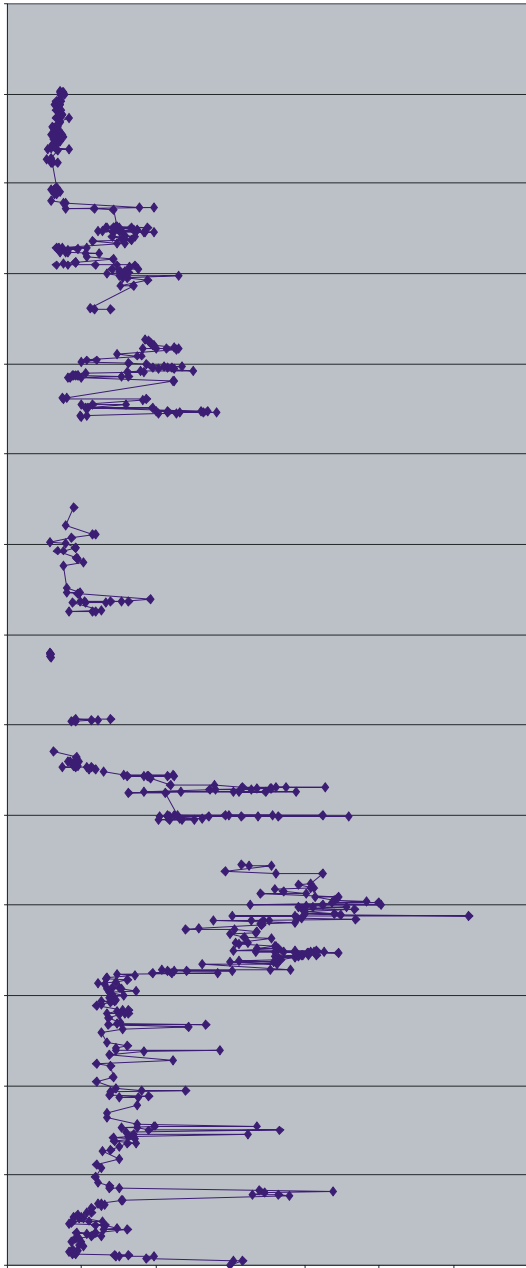


~60km

The unnamed carbonate  
Is simply an  
intermediate facies  
Between Isdell  
and Puntapunta



**13000m  
composite  
thickness**



**Wilki**

**Puntapunta**

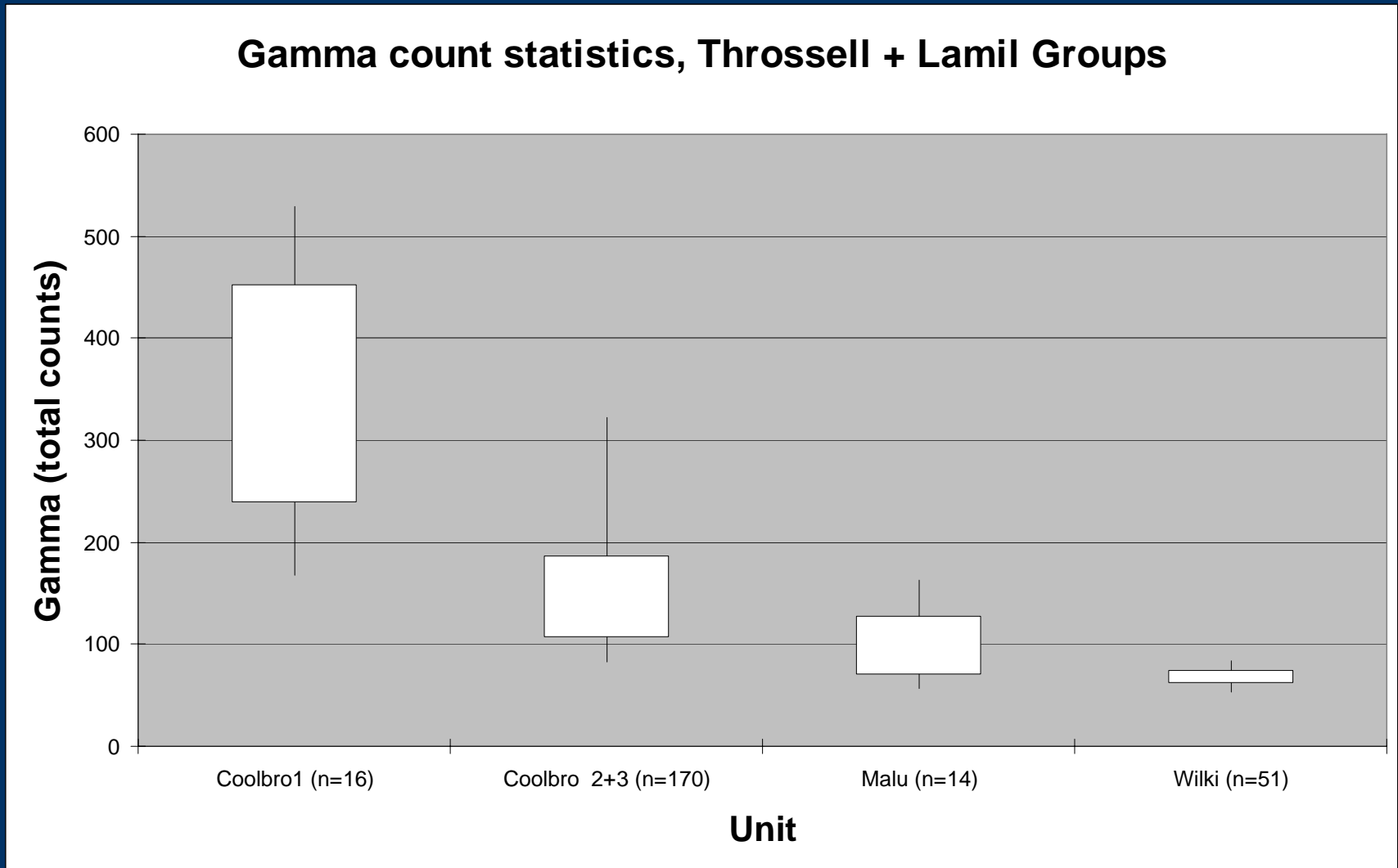
**Malu**

**Isdell**

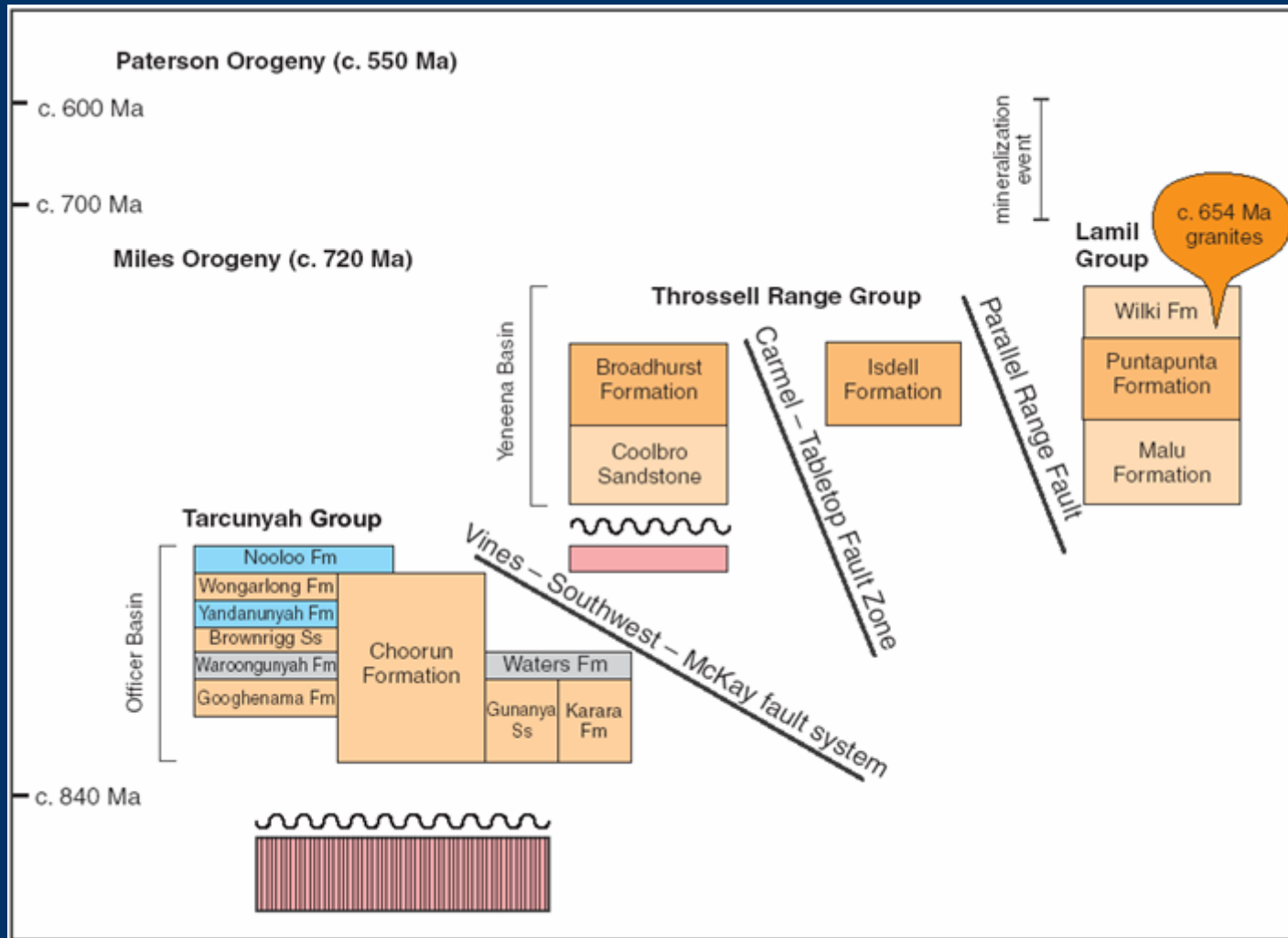
**Broadhurst**

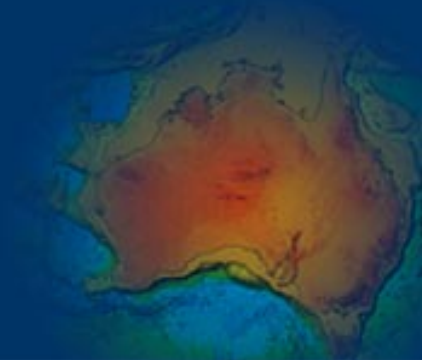
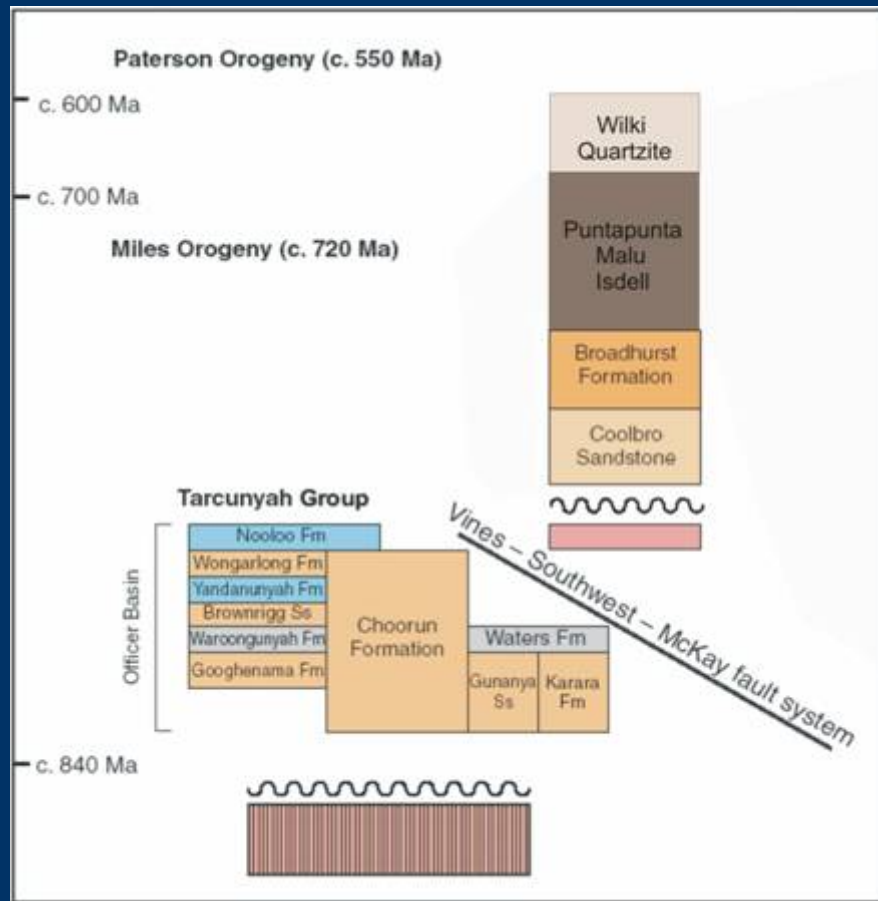
**Coolbro**

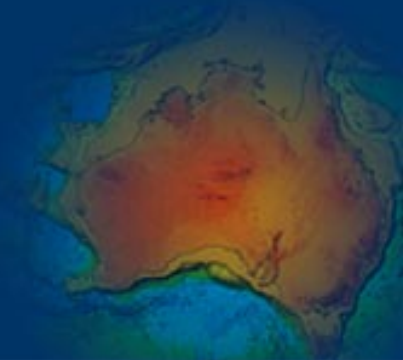
# Gamma stats: useful differentiator

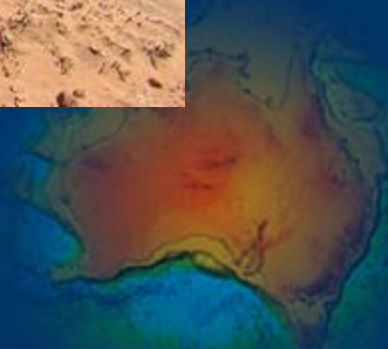


# Simplified Stratigraphy

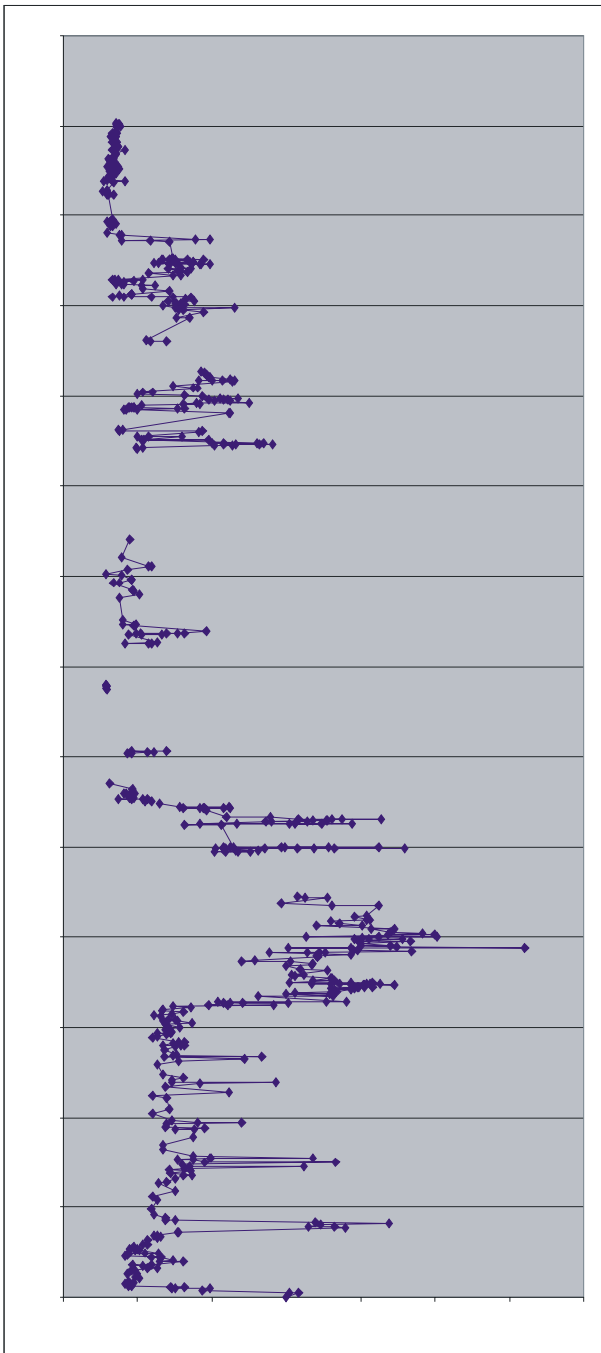








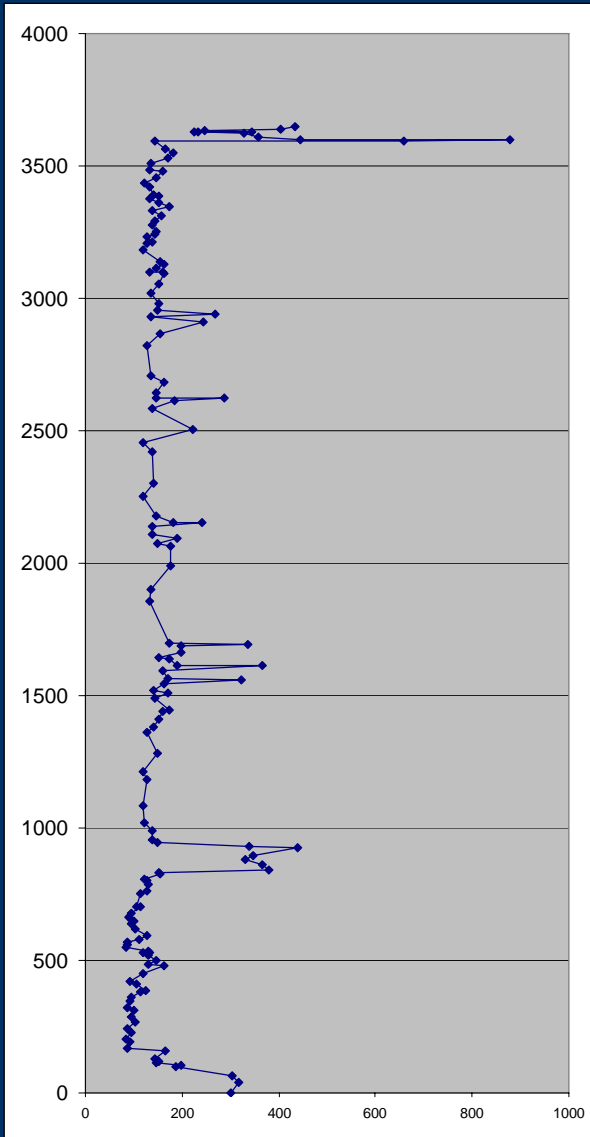
13000m  
composite  
thickness



Telfer

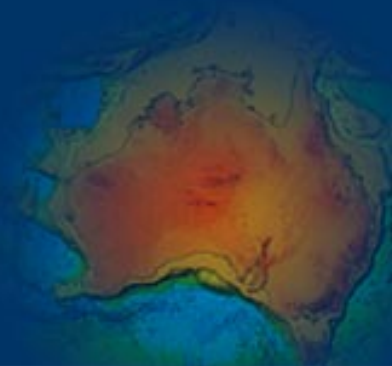
Nifty

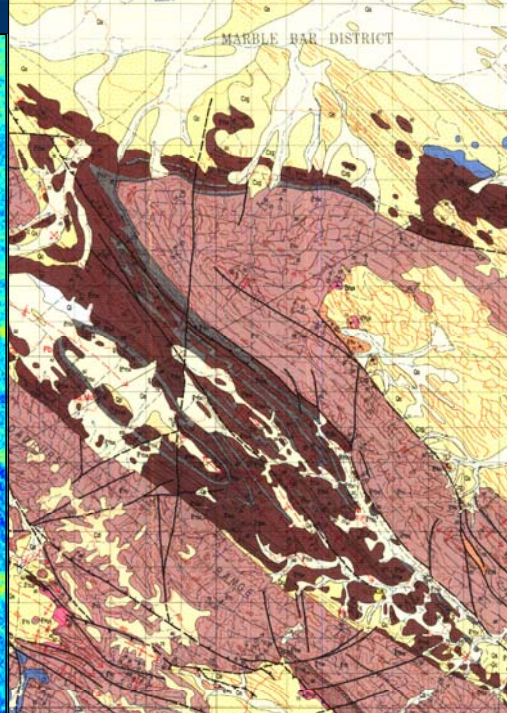
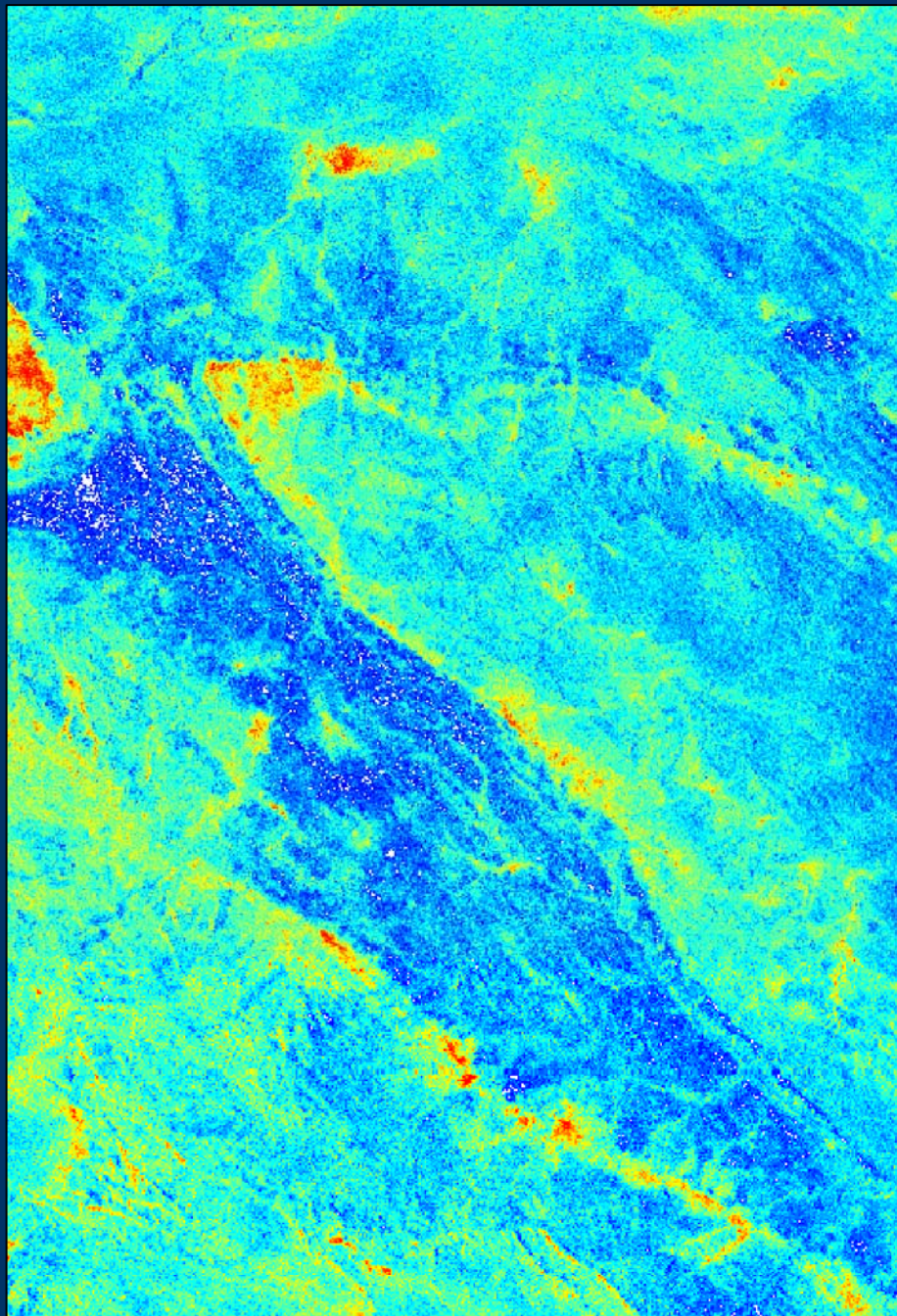
# Mineralisation



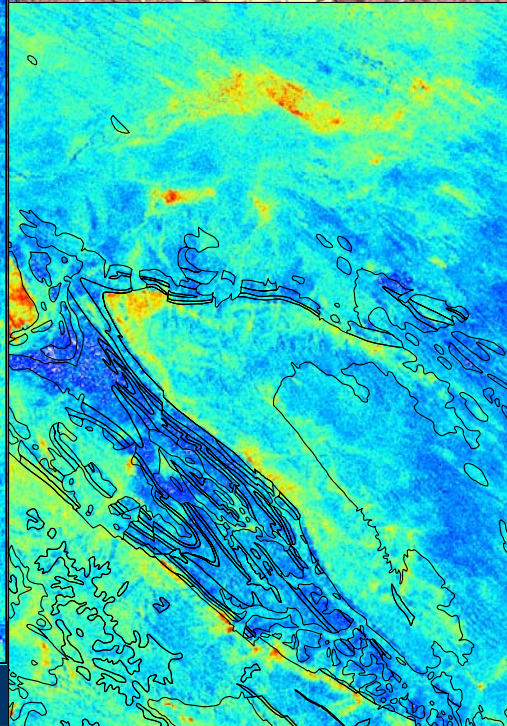
**Gamma spike at top of Coolbro - Uranium?**







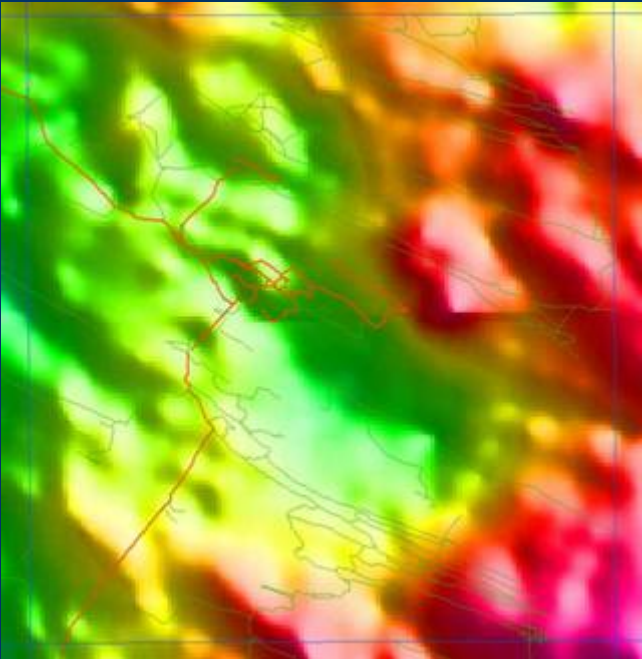
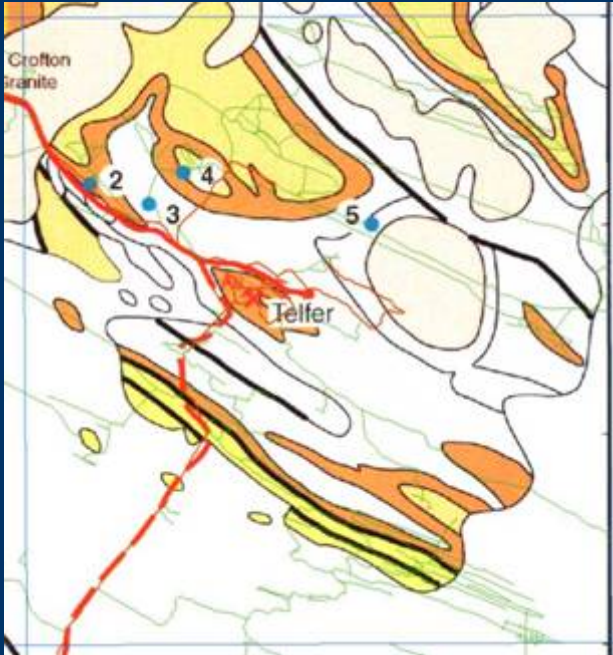
1:100,000  
Geology



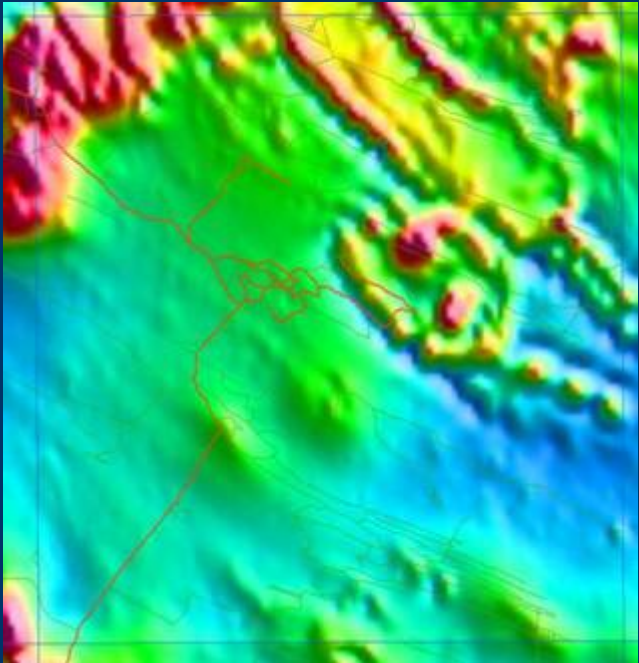
CABS 2005

Alteration

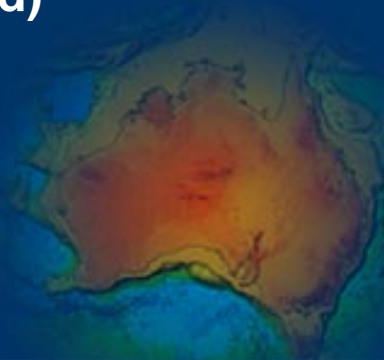
# Granites + Gold at Telfer



Gravity

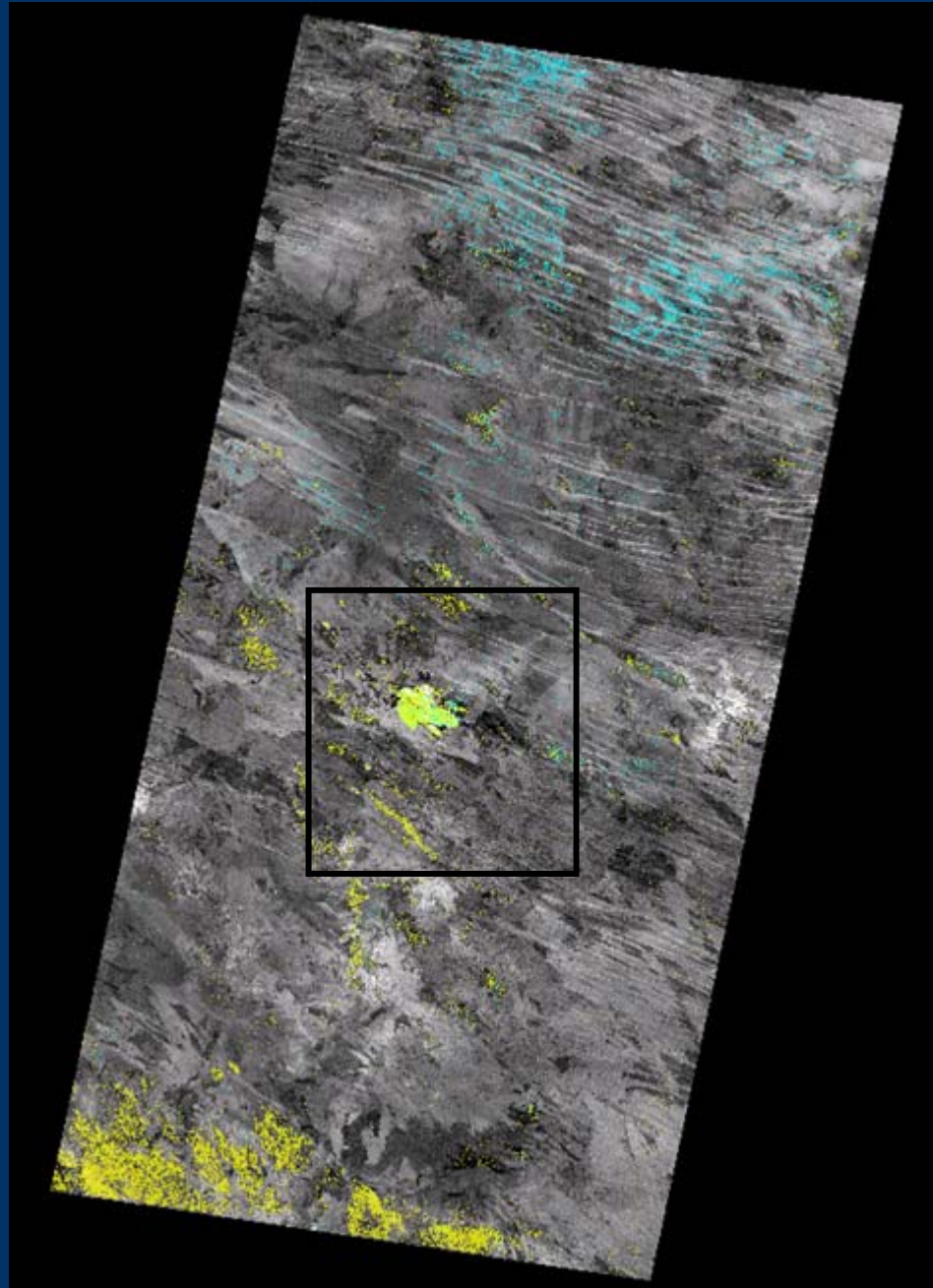


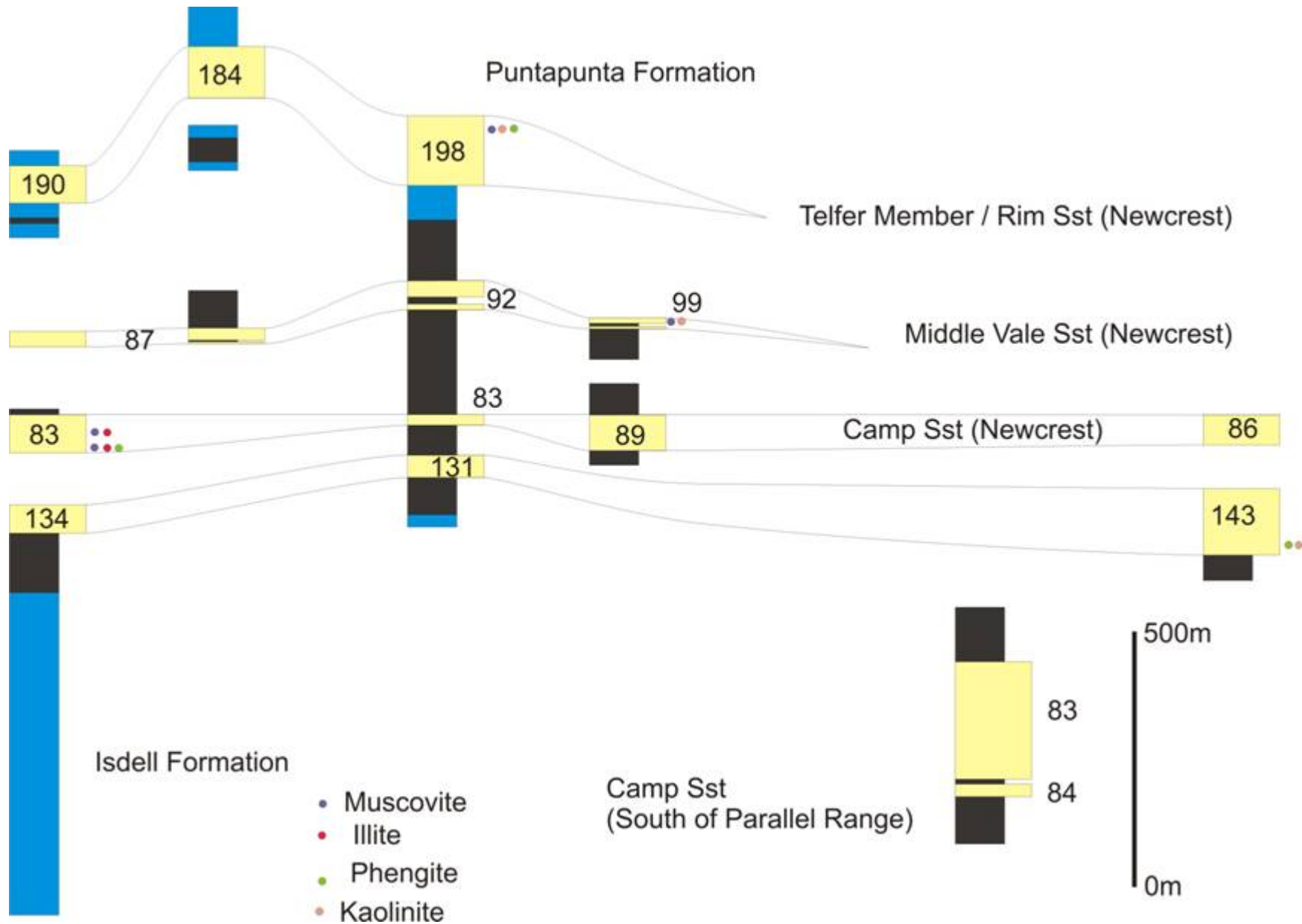
Mag (old)



## Evidence for fluid mixing at Telfer

Blue = muscovite  
Yellow = phengite





# Future work

- Geochronology

  - Stratigraphic dating

    - Detritals using SHRIMP on Zircons

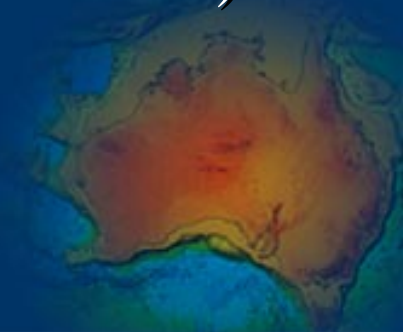
    - Carbonates using whole rock U-Pb

- Mineralisation dating

  - Nifty: U-Pb of ore-related apatite

  - Nifty: Ar-Ar or sericite (and other minerals?)

  - Warrabarty: Sr-Rb of sphalerite



# Future work

- Geophysics

  - Produce depth to Neoproterozoic map out into Canning

  - Ground-truth ASTER data with PIMA

  - Reprocess and reinterpret existing seismic data

  - Seismic...2006?

- Structure

  - Revisit tectonic history from structural work in 2005

  - Resolve structures into their common stress fields

  - Resolve apparent folding within Paterson Formation  
(Permian)



# Future work

- Stratigraphy

Whole-rock geochemistry to test provenance

Illite crystallinity on siltstones to test depth of burial

See if folding in Lamil-Throssell gap is in aeromag.

Place mineral deposits with seq. strat. framework

Generate 3D isopach maps

Tackle the Tarcunyah Group (south)

Correlate Paterson Supersequence with other terranes?

