

Digging Deeper 10
5th December, 2012

Geology and geochronology of the Thomson Orogen in Queensland

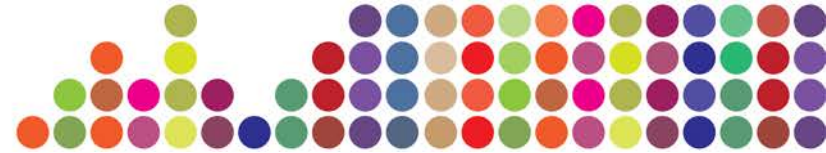
Patrick Carr, David Purdy and Dominic Brown
Geological Survey of Queensland

Andrew Cross and Natalie Kositcin
Geoscience Australia



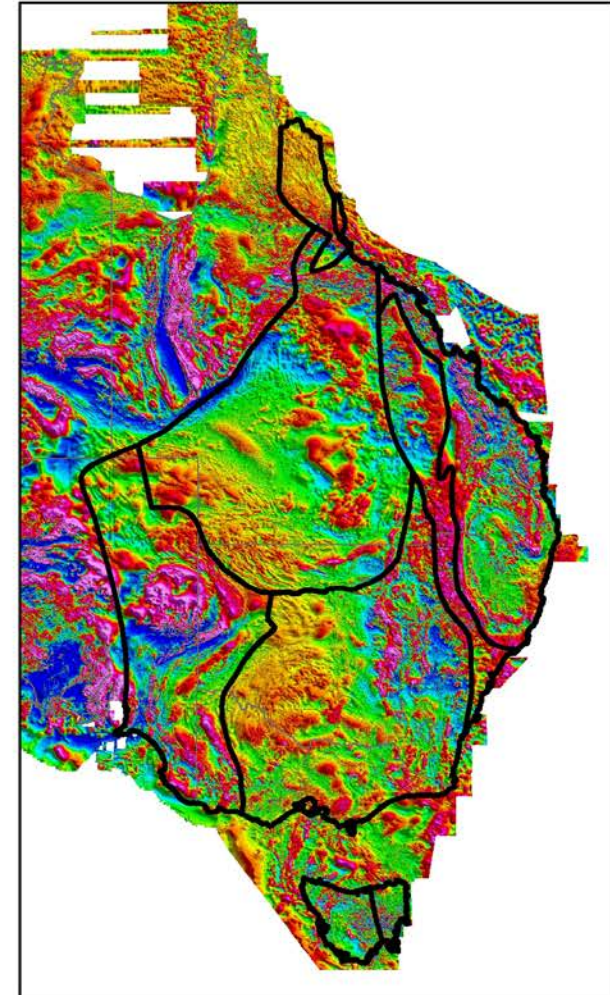
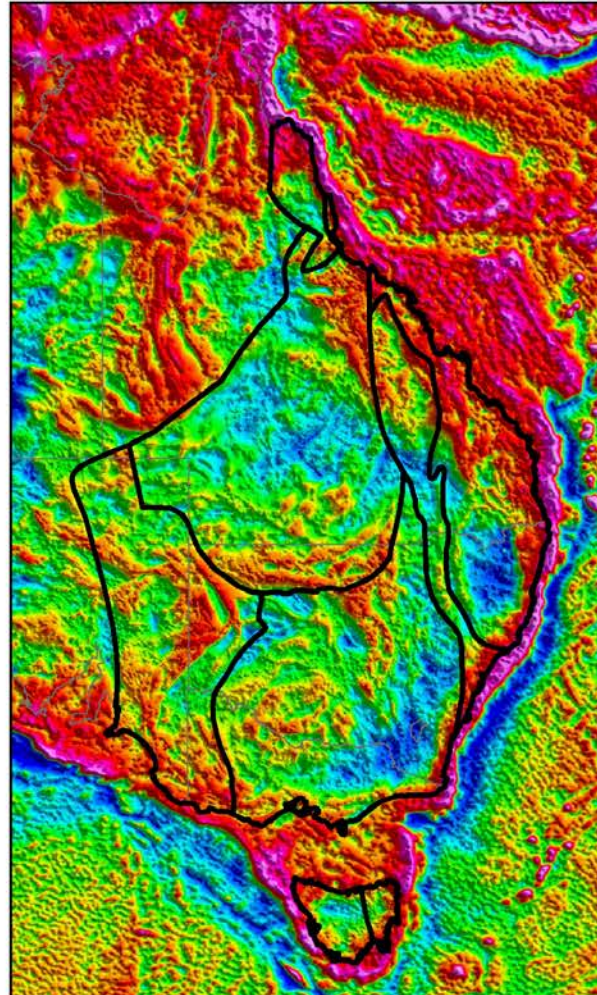
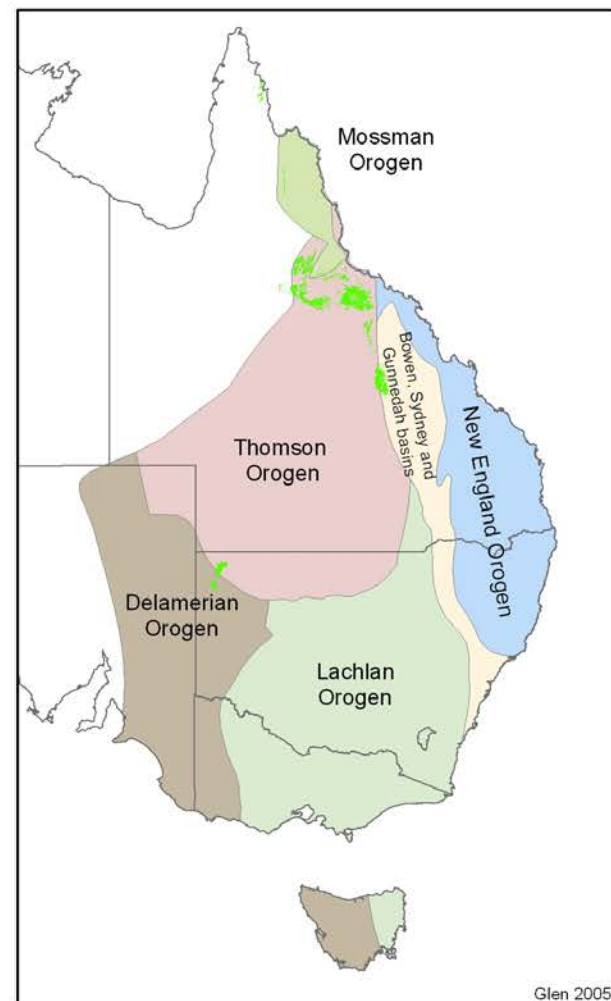
Queensland
Government

Outline of presentation



- Context of the project
 - The Tasmanides of eastern Australia
 - The outcropping rocks of Queensland and New South Wales
- Undercover geology
 - Depth to basement
 - Lithology
- Regional correlations
 - Geophysics
 - Detrital zircon study
- Future work

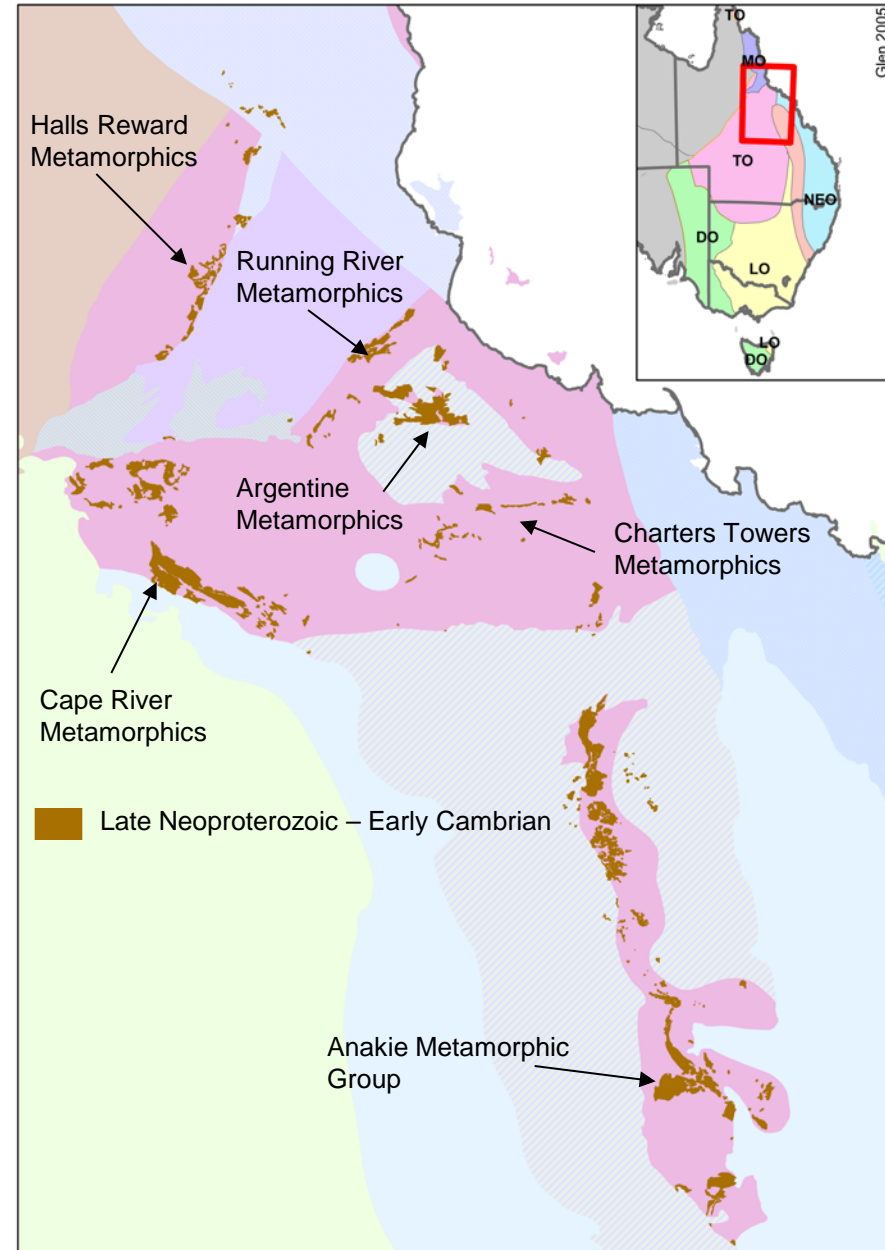
The Tasmanides



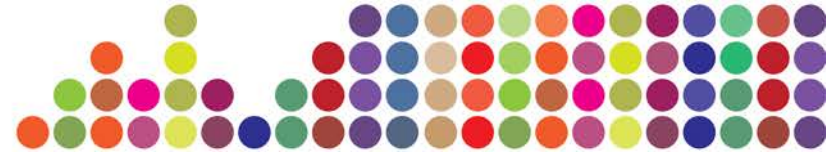


Late Neoproterozoic – Early Cambrian

Late Neoproterozoic to Early Cambrian packages of strongly deformed, predominantly fine grained metasediments with minor mafic igneous rocks.

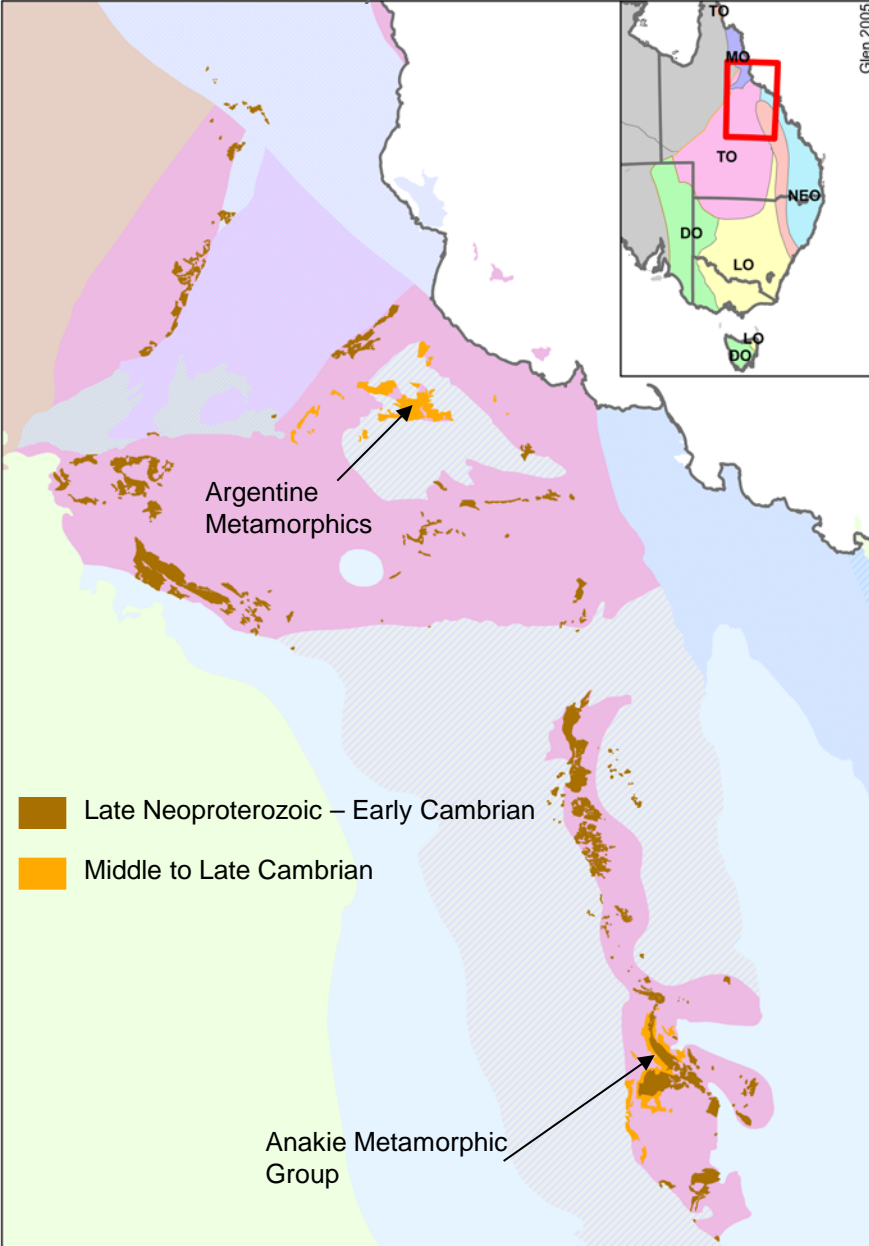


Delamerian Orogen (Middle to Late Cambrian)

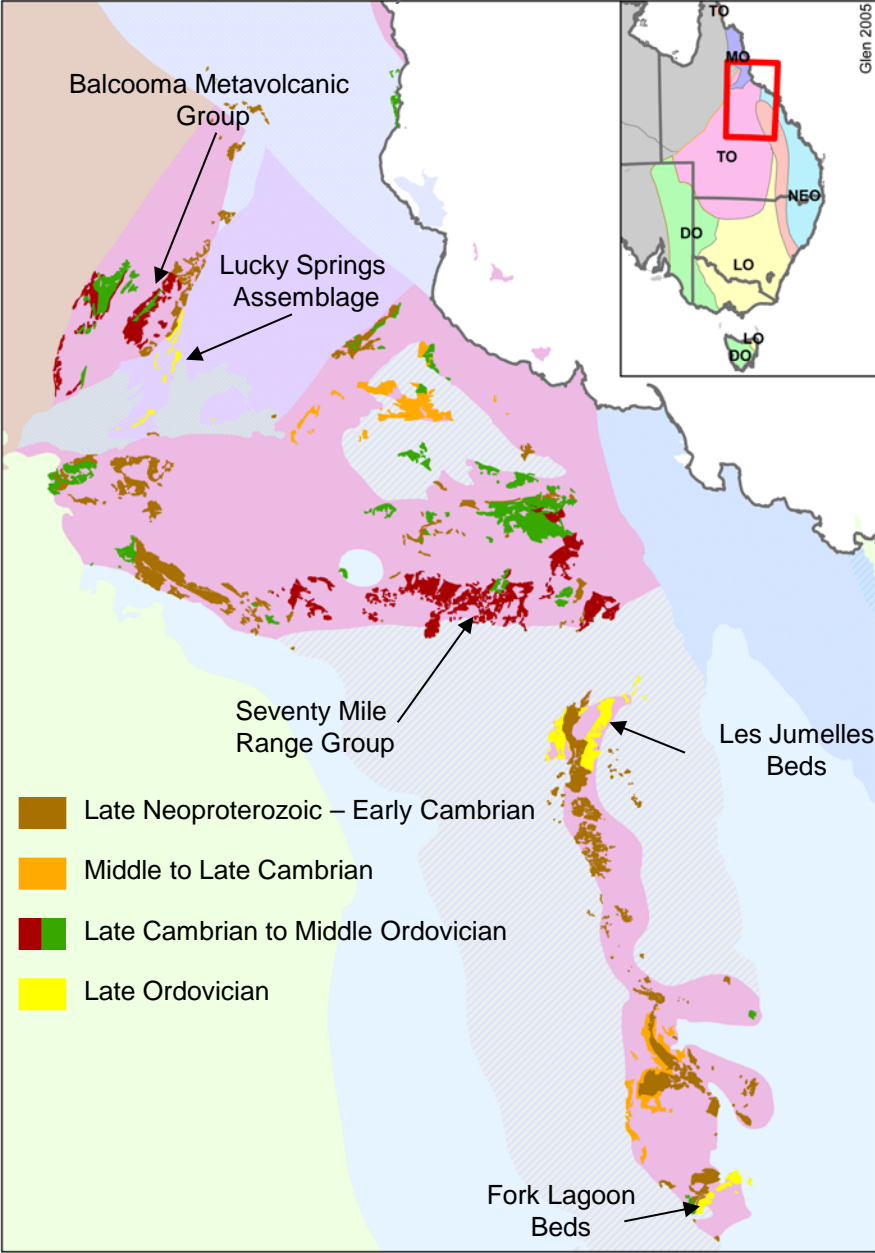


Late Neoproterozoic to Early Cambrian packages of strongly deformed, predominantly fine grained metasediments with minor mafic igneous rocks.

Middle to Late Cambrian package of deformed metasediments continuing through the Delamerian Orogen.



Post-Delamerian (Late Cambrian to Late Ordovician)



Late Neoproterozoic to Early Cambrian packages of strongly deformed, predominantly fine grained metasediments with minor mafic igneous rocks.

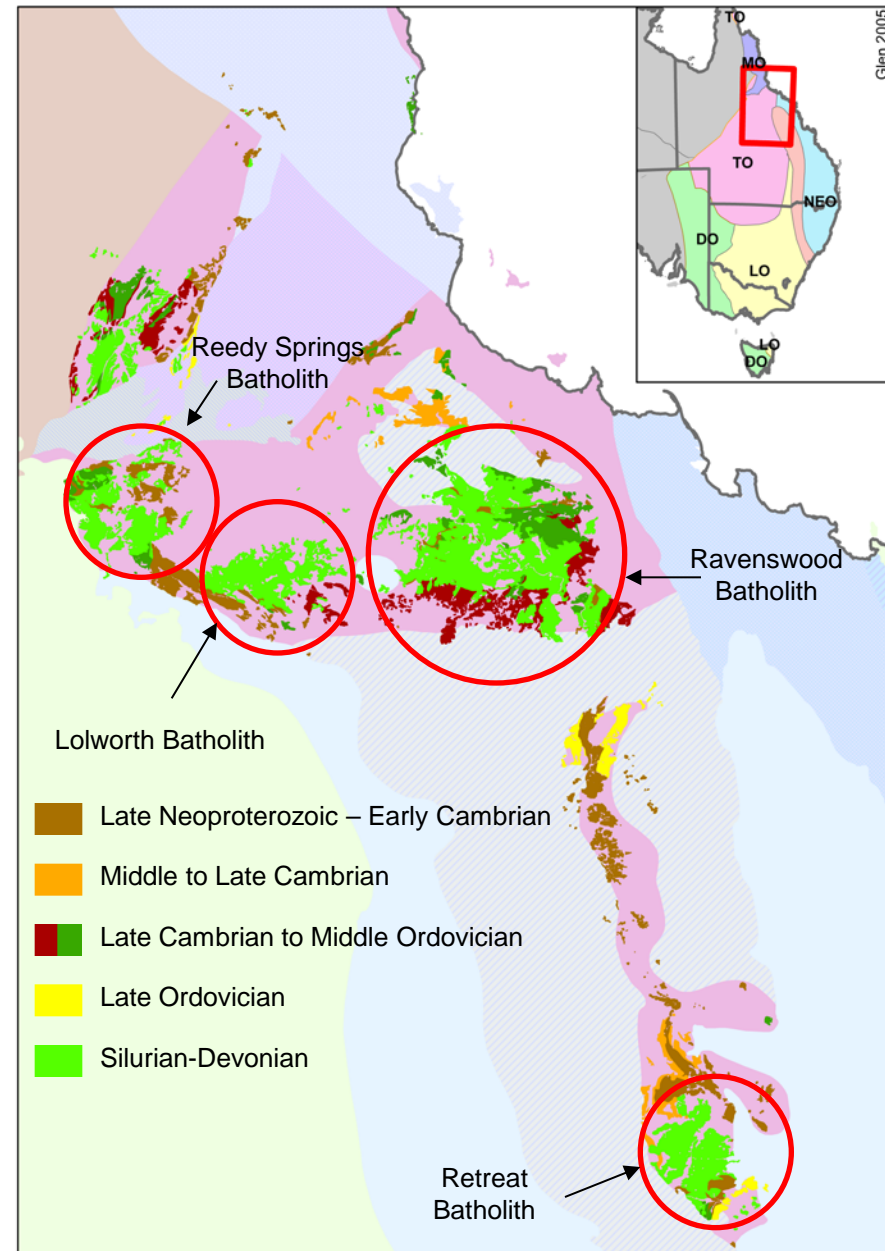
Middle to Late Cambrian package of deformed metasediments continuing through the Delamerian Orogen.

Silicic volcanism (and associated sedimentation) and granite emplacement.

Closely followed by Late Ordovician shallow marine sediments and mafic to intermediate volcanics.



Benambran (and post-) Orogeny



Late Neoproterozoic to Early Cambrian packages of strongly deformed, predominantly fine grained metasediments with minor mafic igneous rocks.

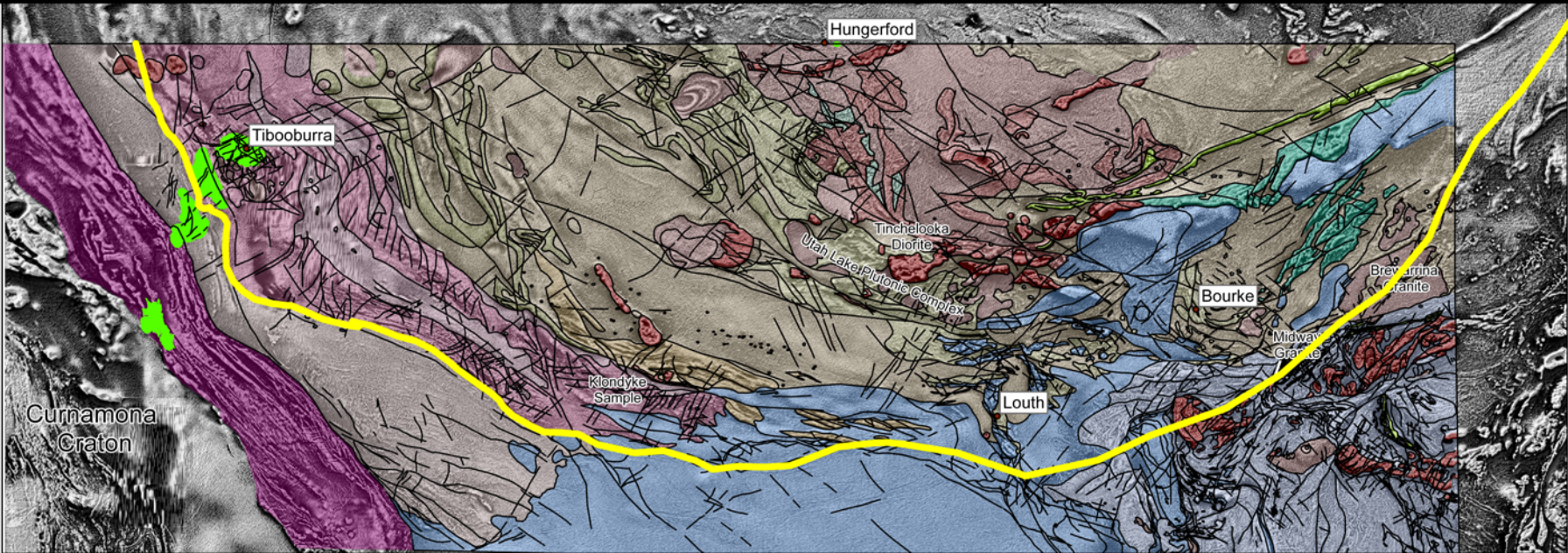
Middle to Late Cambrian package of deformed metasediments continuing through the Delamerian Orogen.

Silicic volcanism (and associated sedimentation) and granite emplacement.

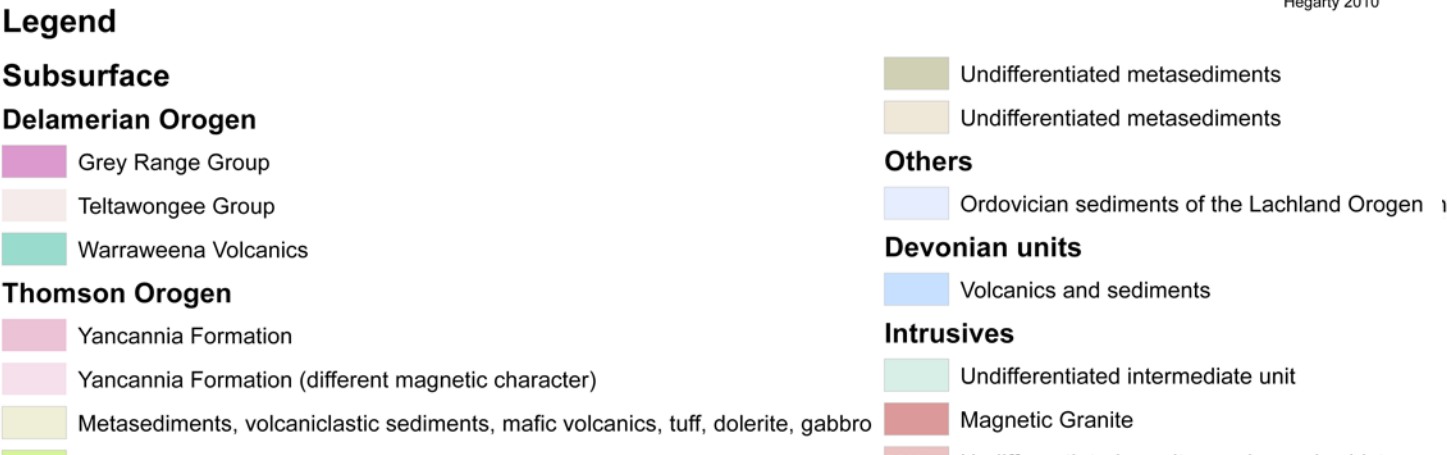
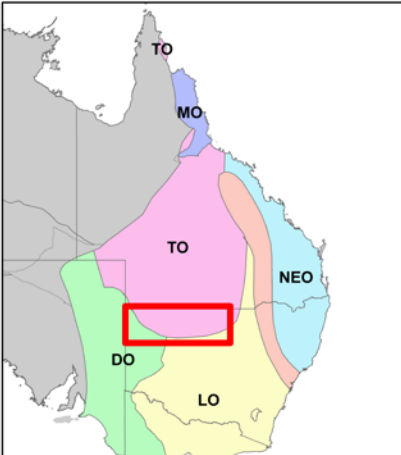
Closely followed by Late Ordovician shallow marine sediments and mafic to intermediate volcanics.

Extensive granite emplacement during the Siluro-Devonian

Similar story in NSW



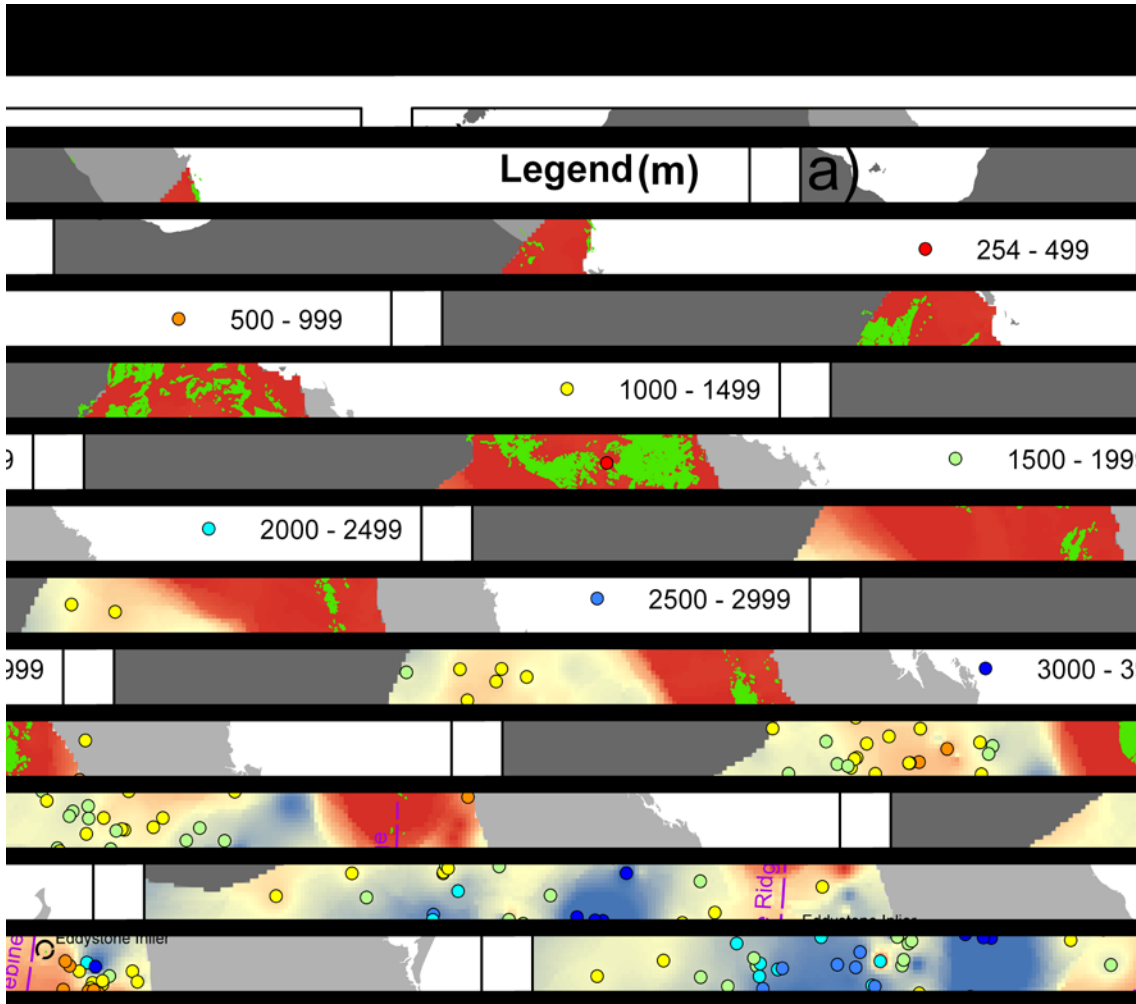
Hegarty 2010





The Thomson Orogen undercover

Depth to Thomson Orogen



New product from the GSQ:

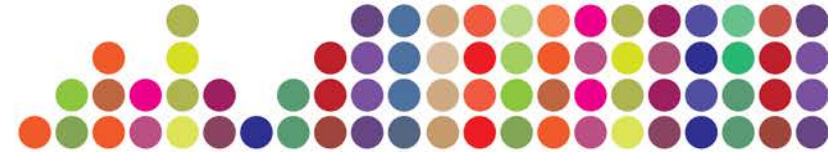
“Database of basement drill holes in the Thomson Orogen and Roma Shelf regions, Queensland” – Brown & others, 2012

Approximately 4km deep beneath the Cooper Basin

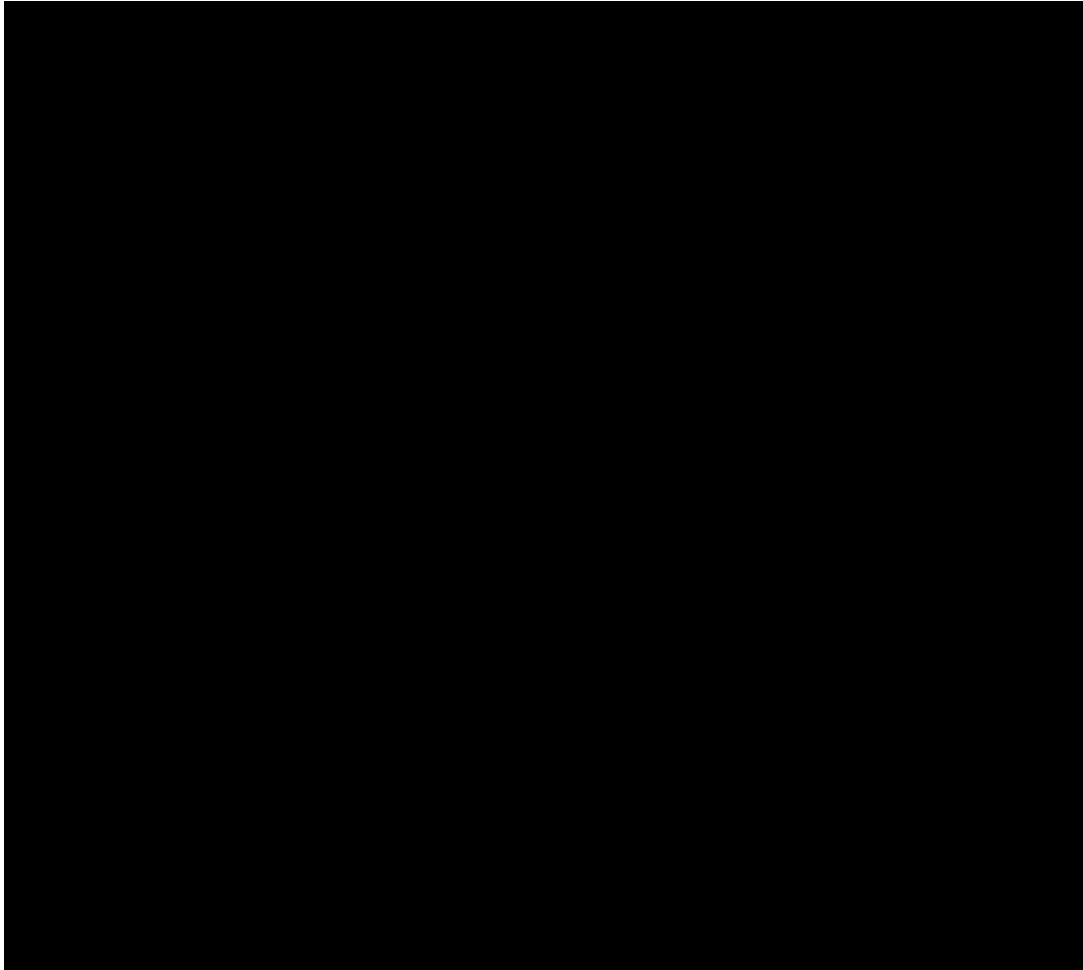
Uneven distribution of holes; shallowest areas have poorest control.

Strong continuation of basement highs: “Eulo Ridge” and “Nebine Ridge”.

The Thomson Orogen undercover

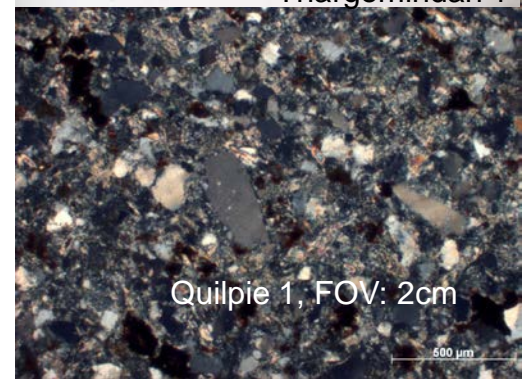


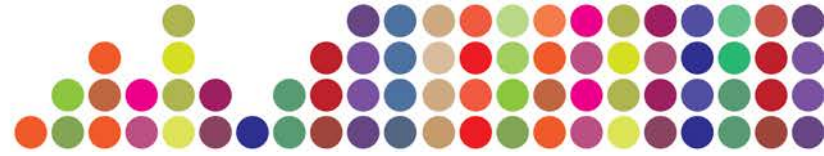
Sediments



Lithology

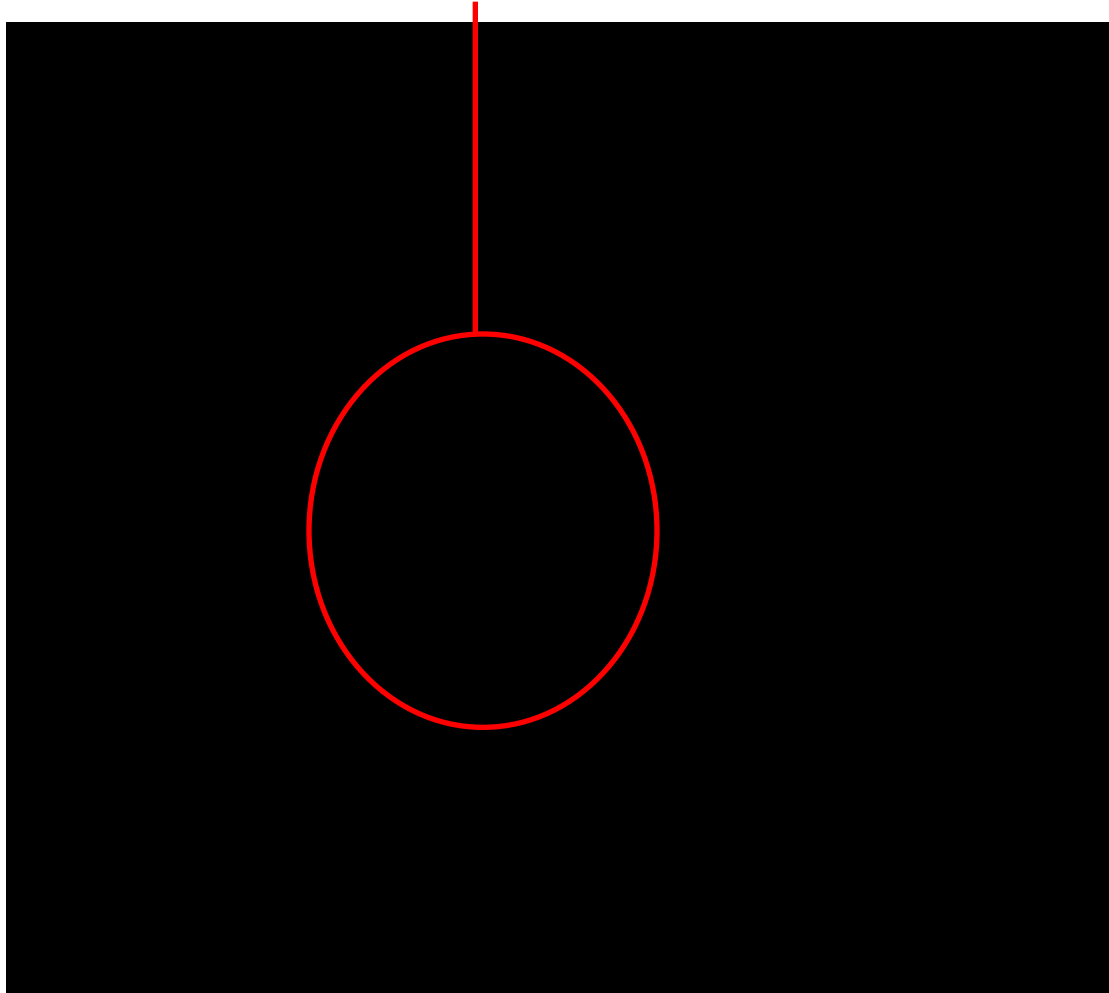
1. F
2. In
3. G



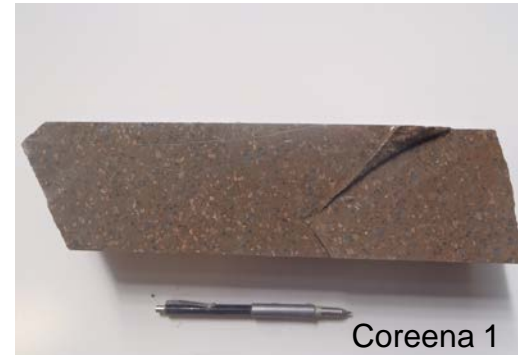


The Thomson Orogen undercover

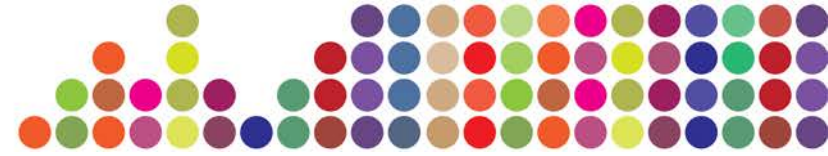
Early Ordovician volcanic complex



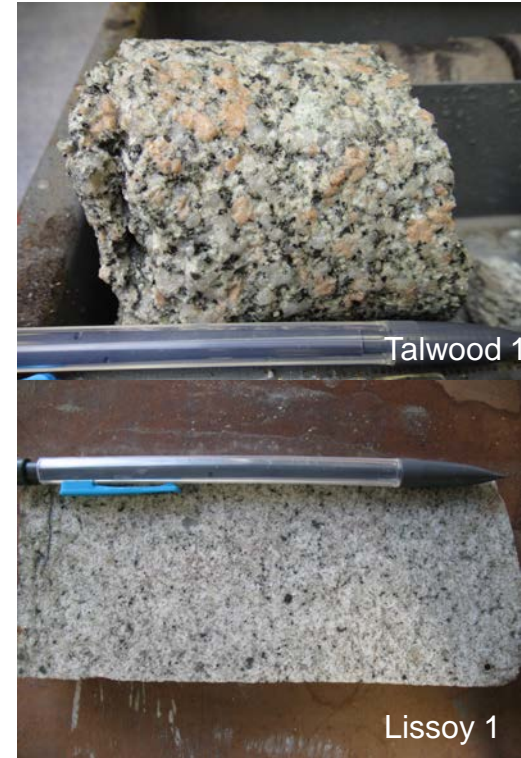
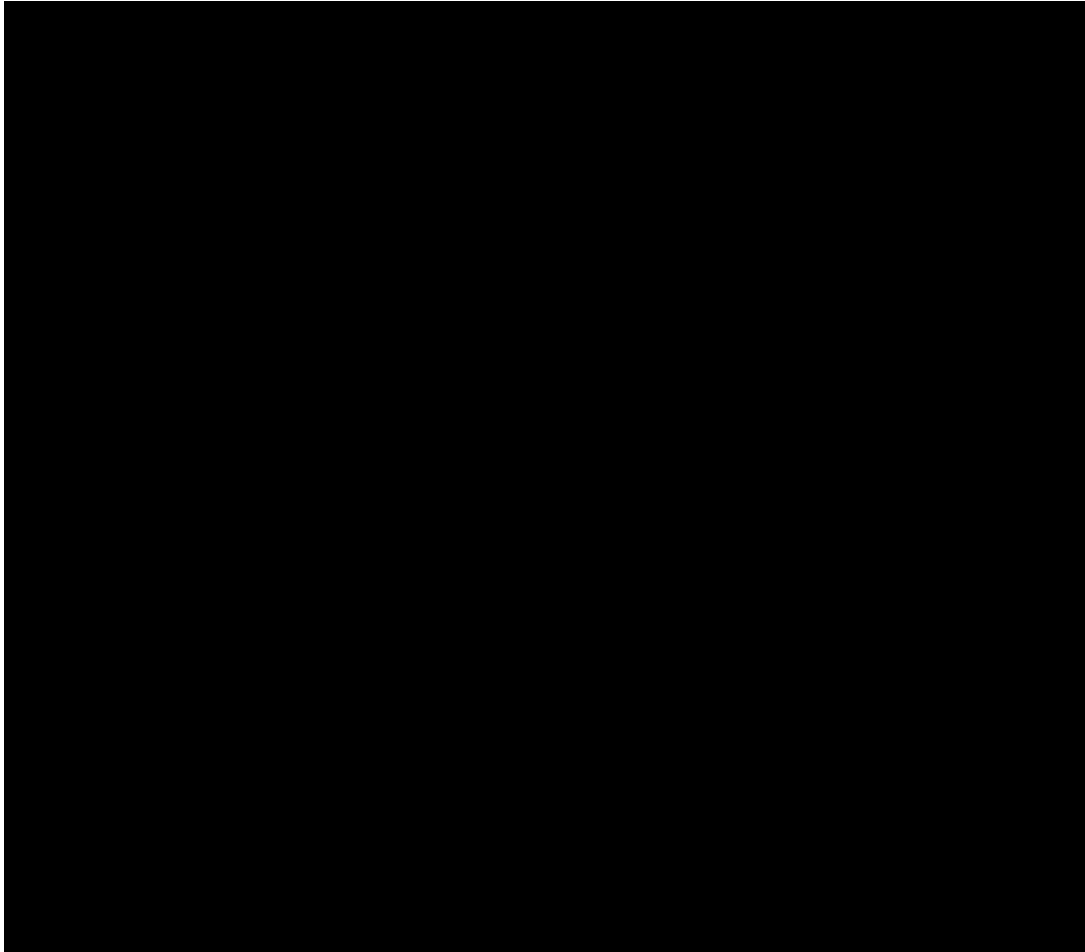
Volcanics:



The Thomson Orogen undercover

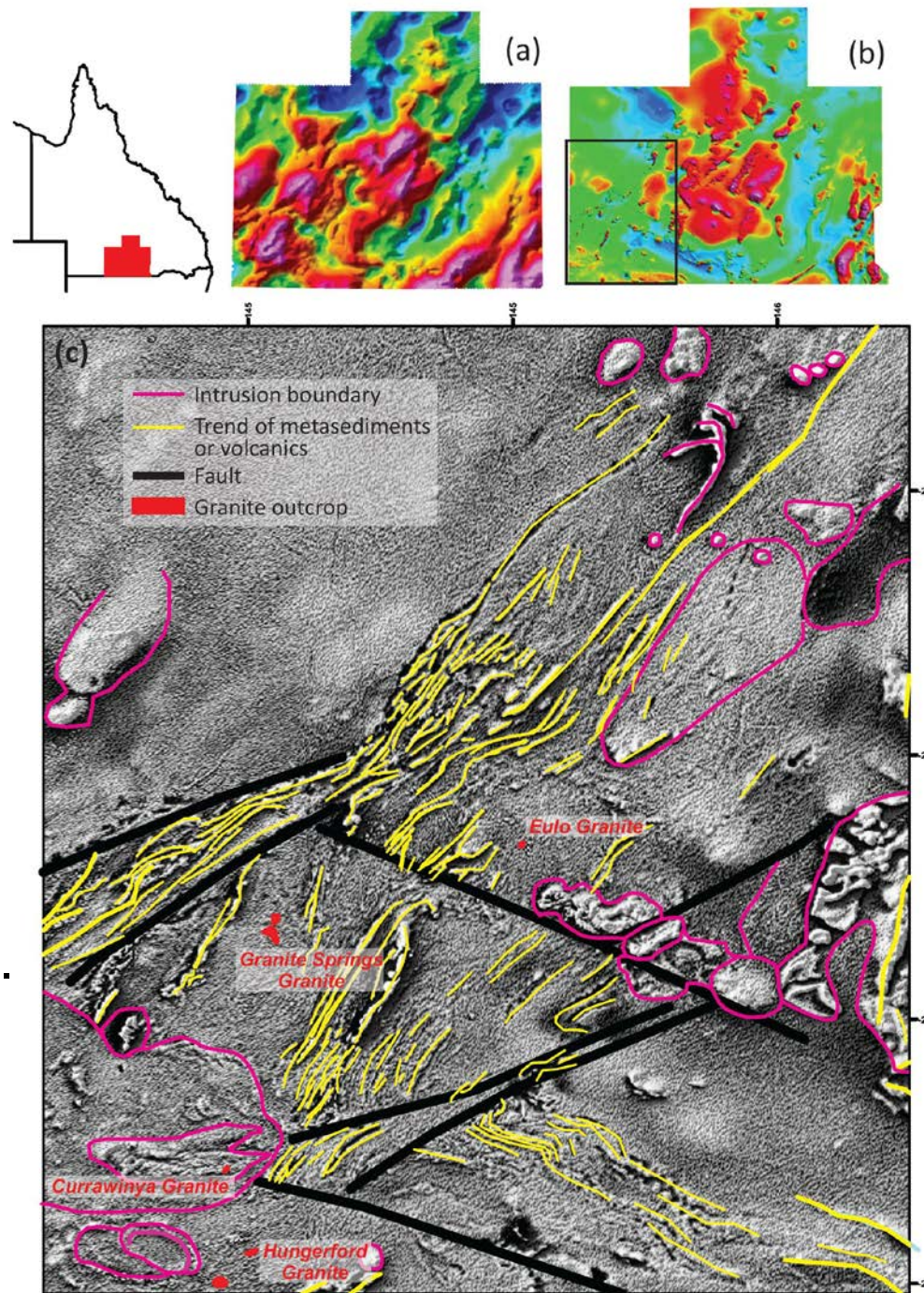


Granites



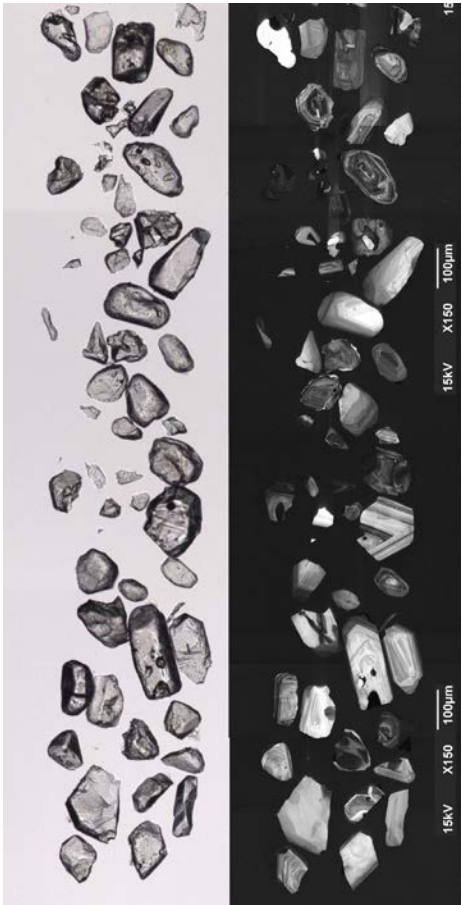
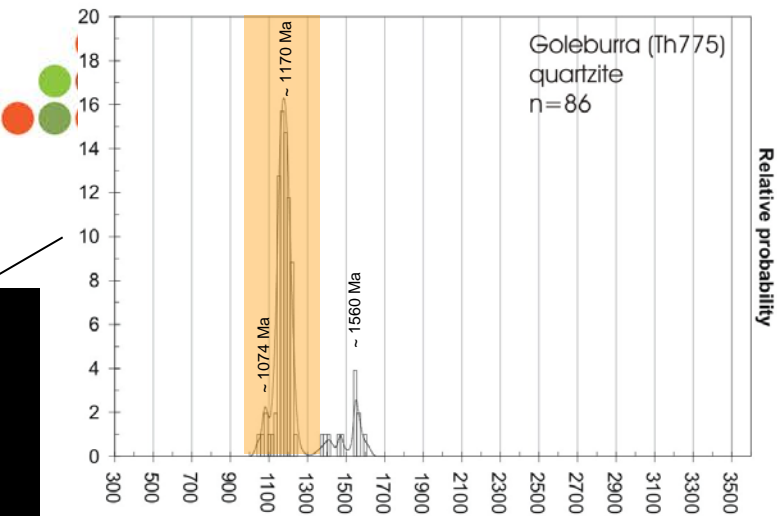
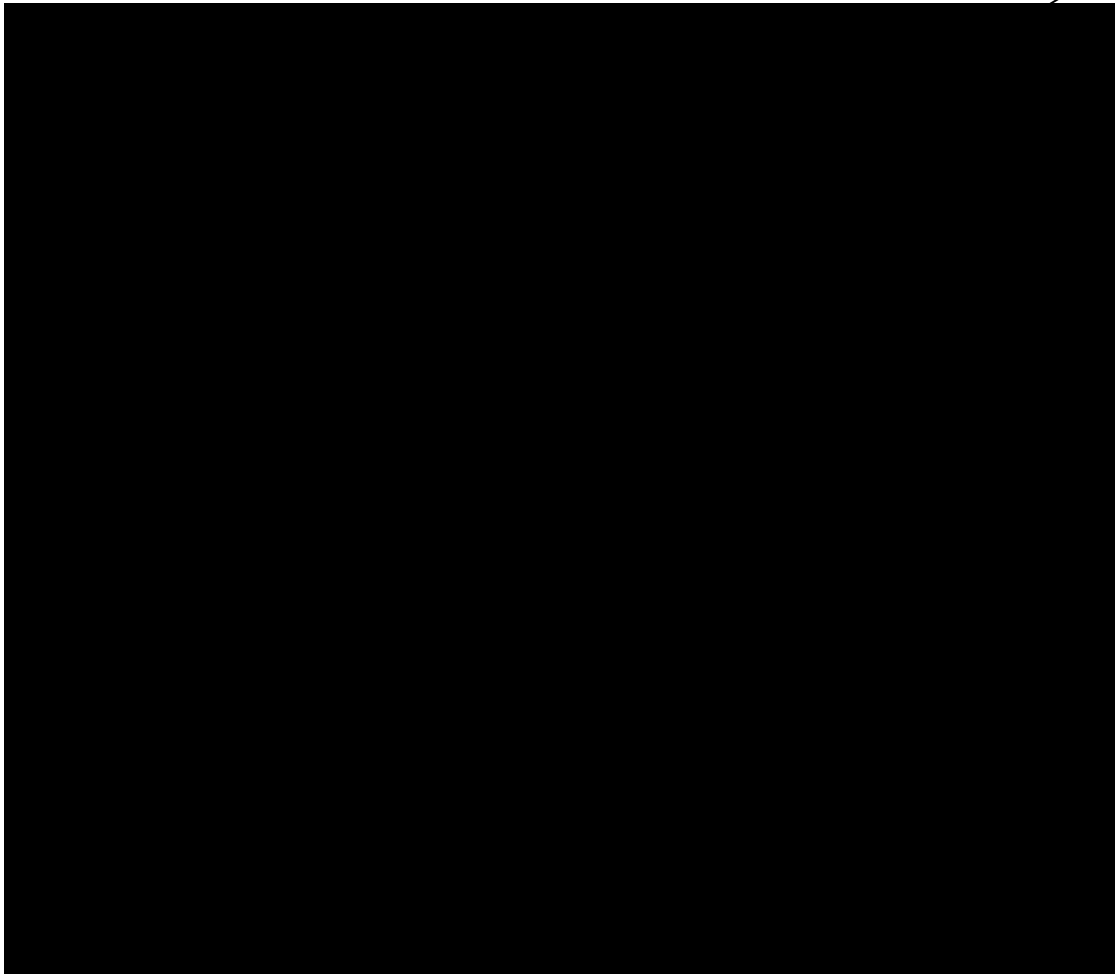
Regional Correlations

- Geophysics
- New airborne gravity, magnetic and radiometric survey of the southern Thomson Orogen
- Widespread stratigraphic lineations commonly disrupted by large-scale faults and intrusive complexes.
- Poor correlation between magnetic signature and outcrop.

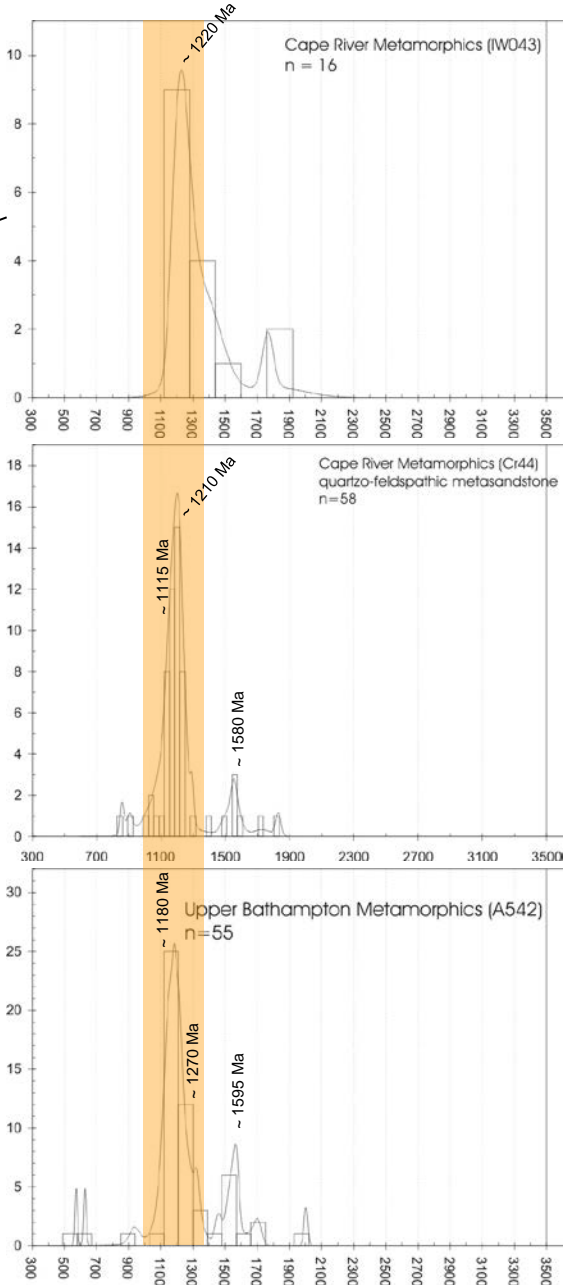
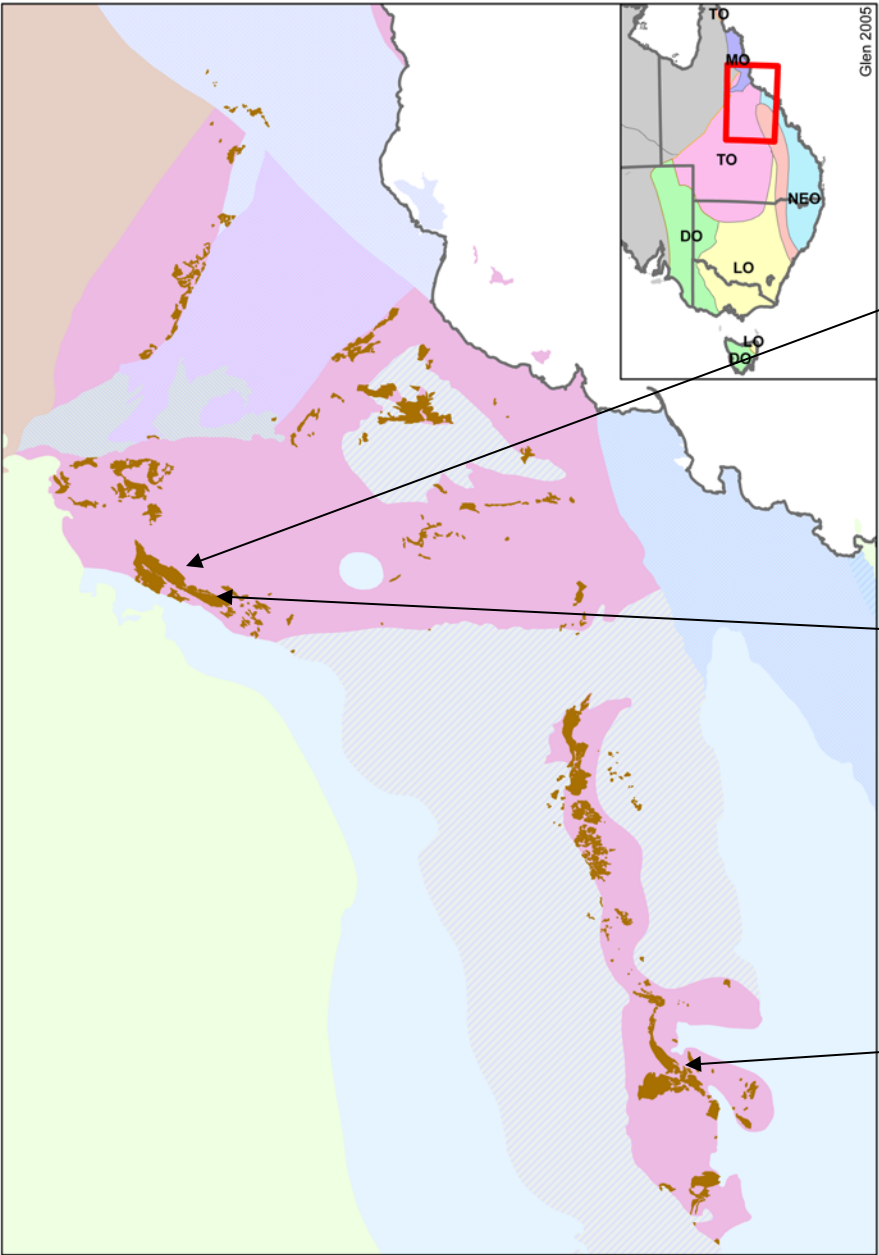


Regional Correlations

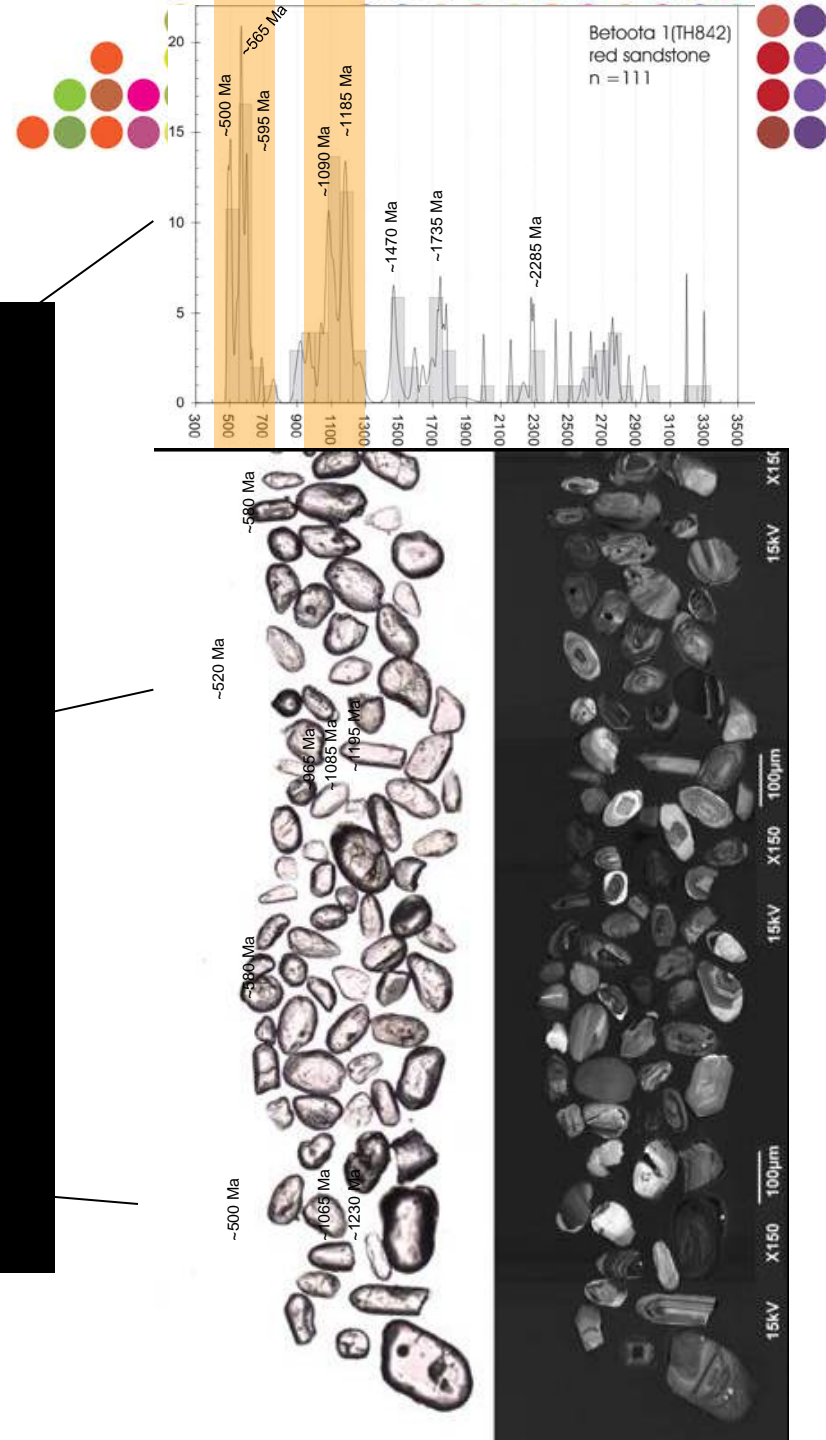
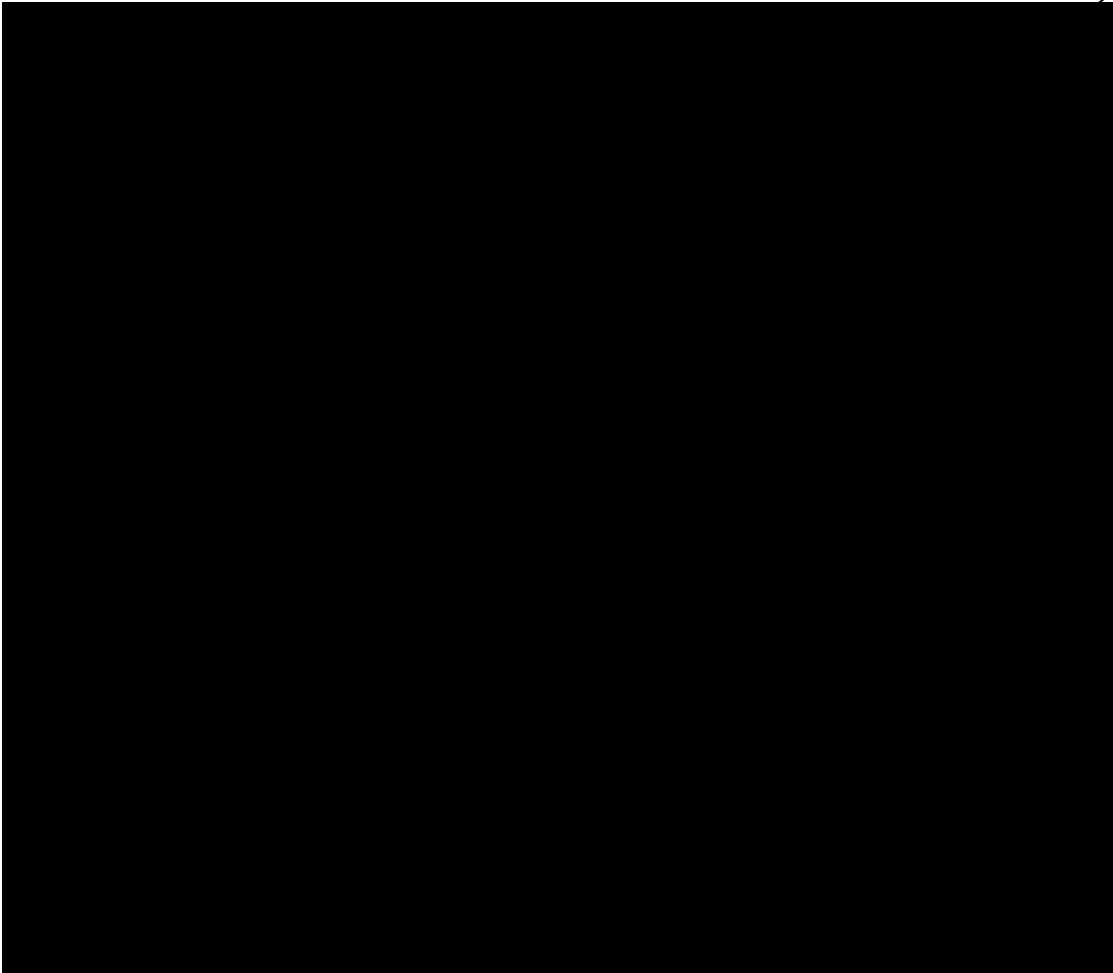
U-Pb (SHRIMP) detrital zircon analysis



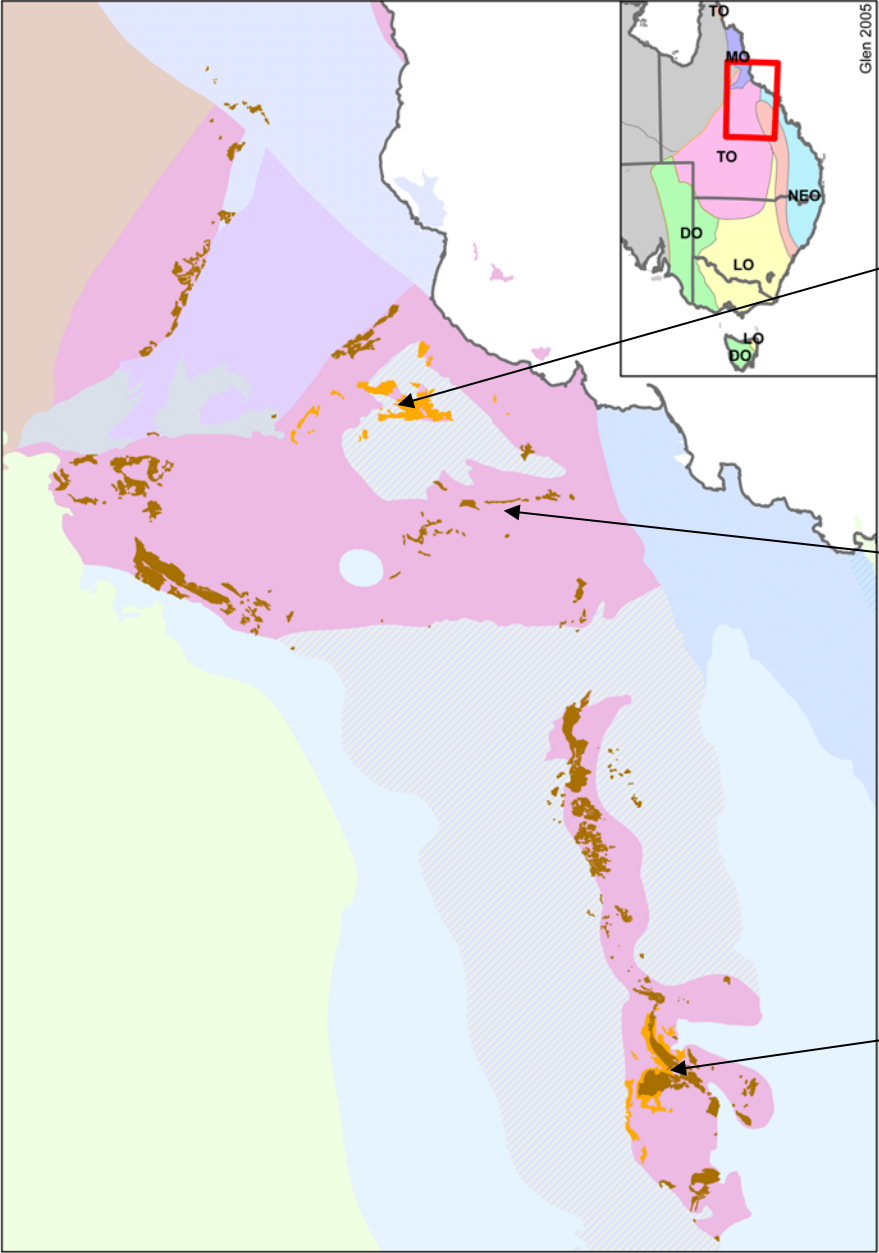
Regional Correlations



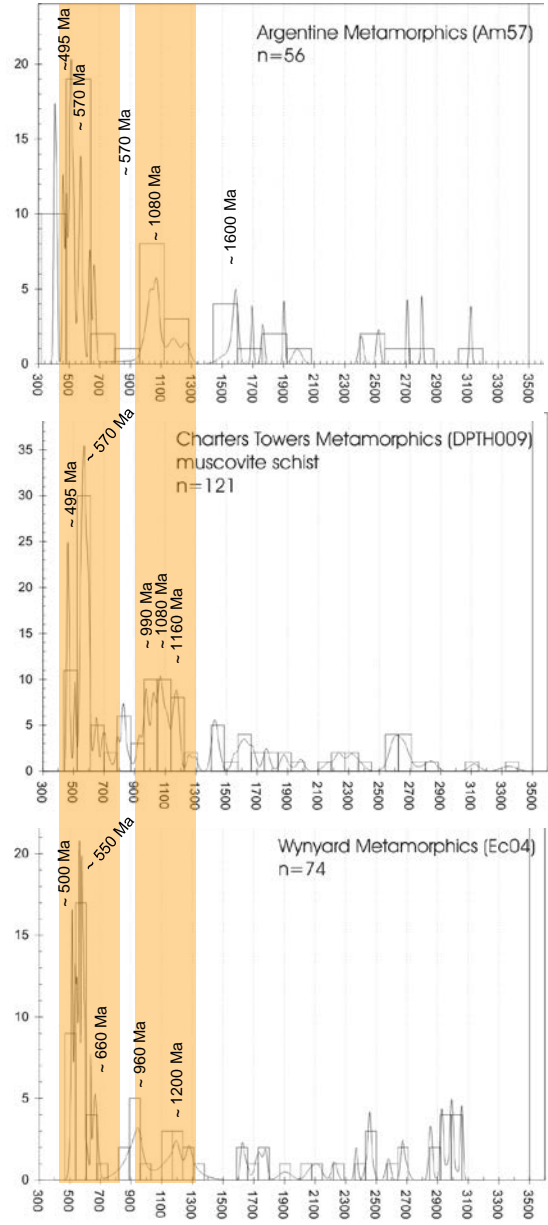
Regional Correlations



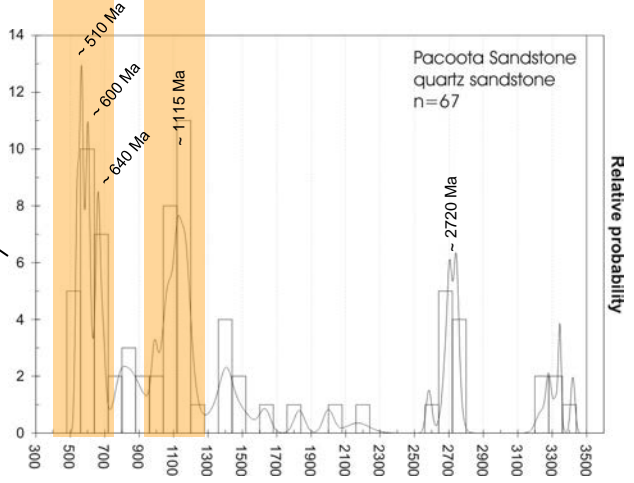
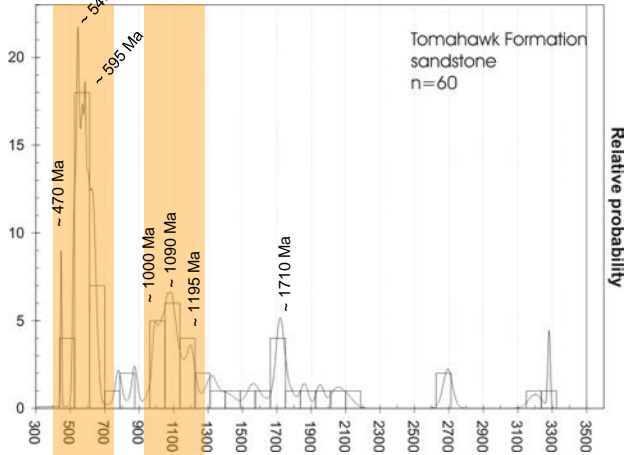
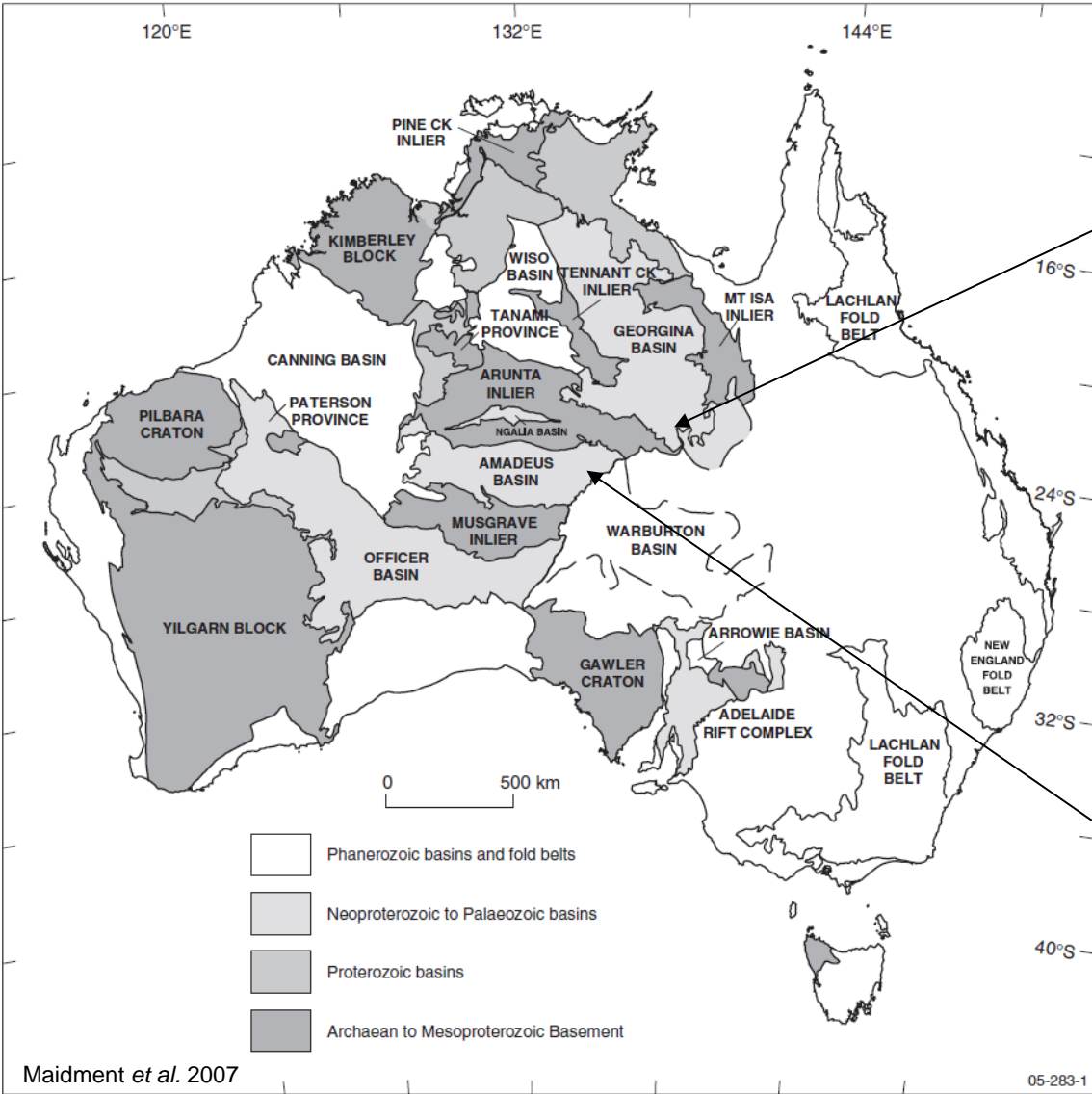
Regional Correlations



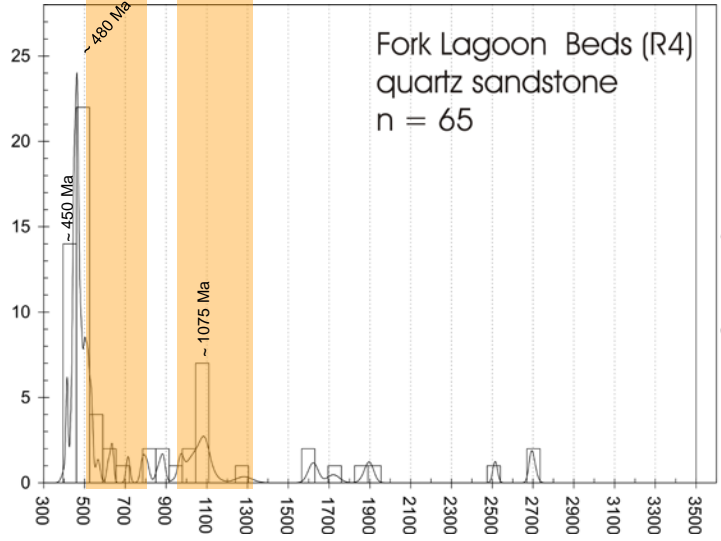
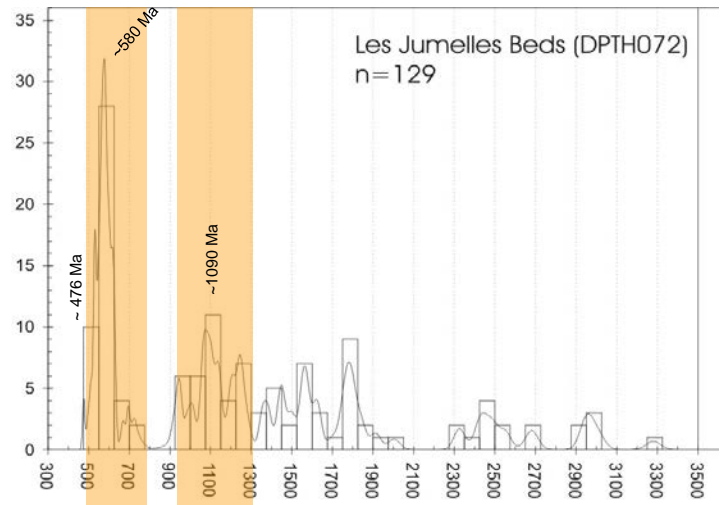
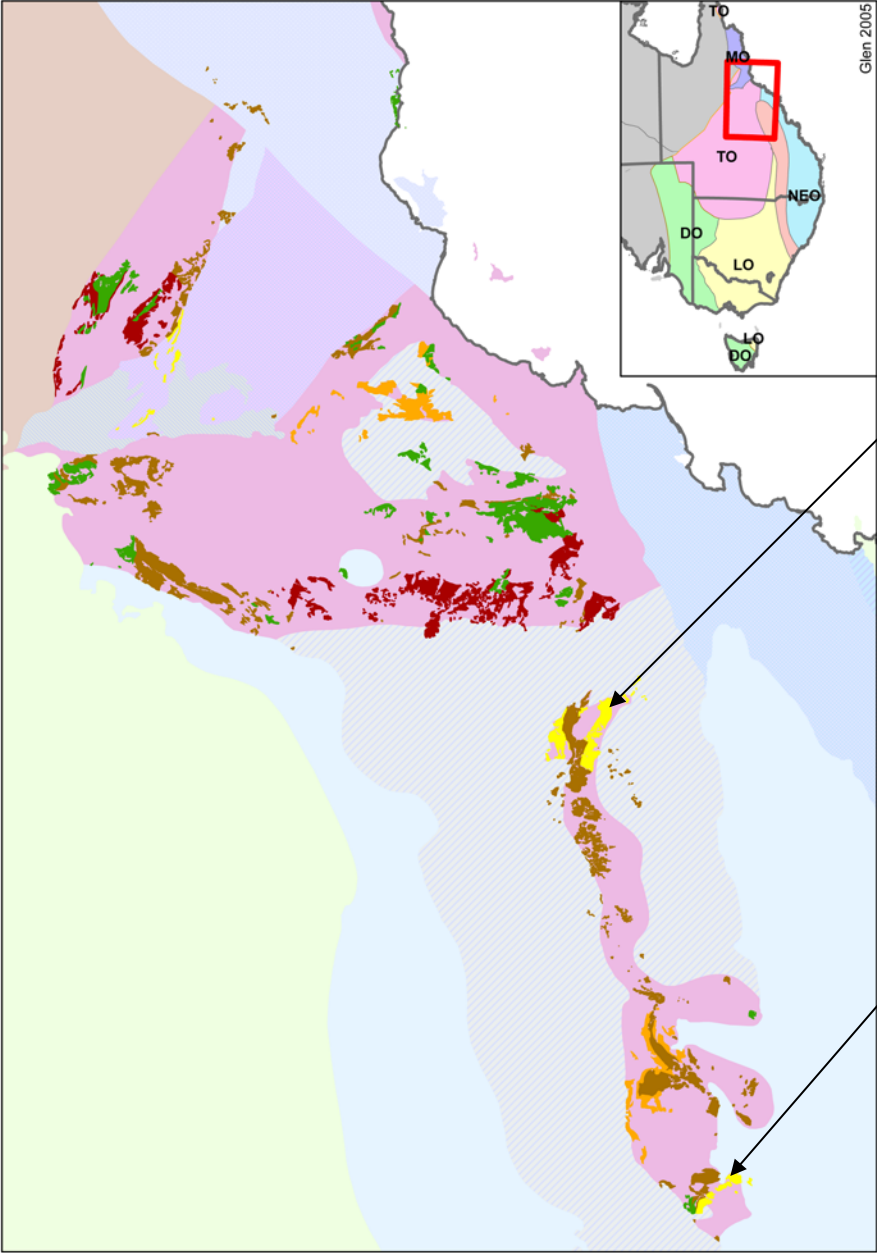
Glen 2005

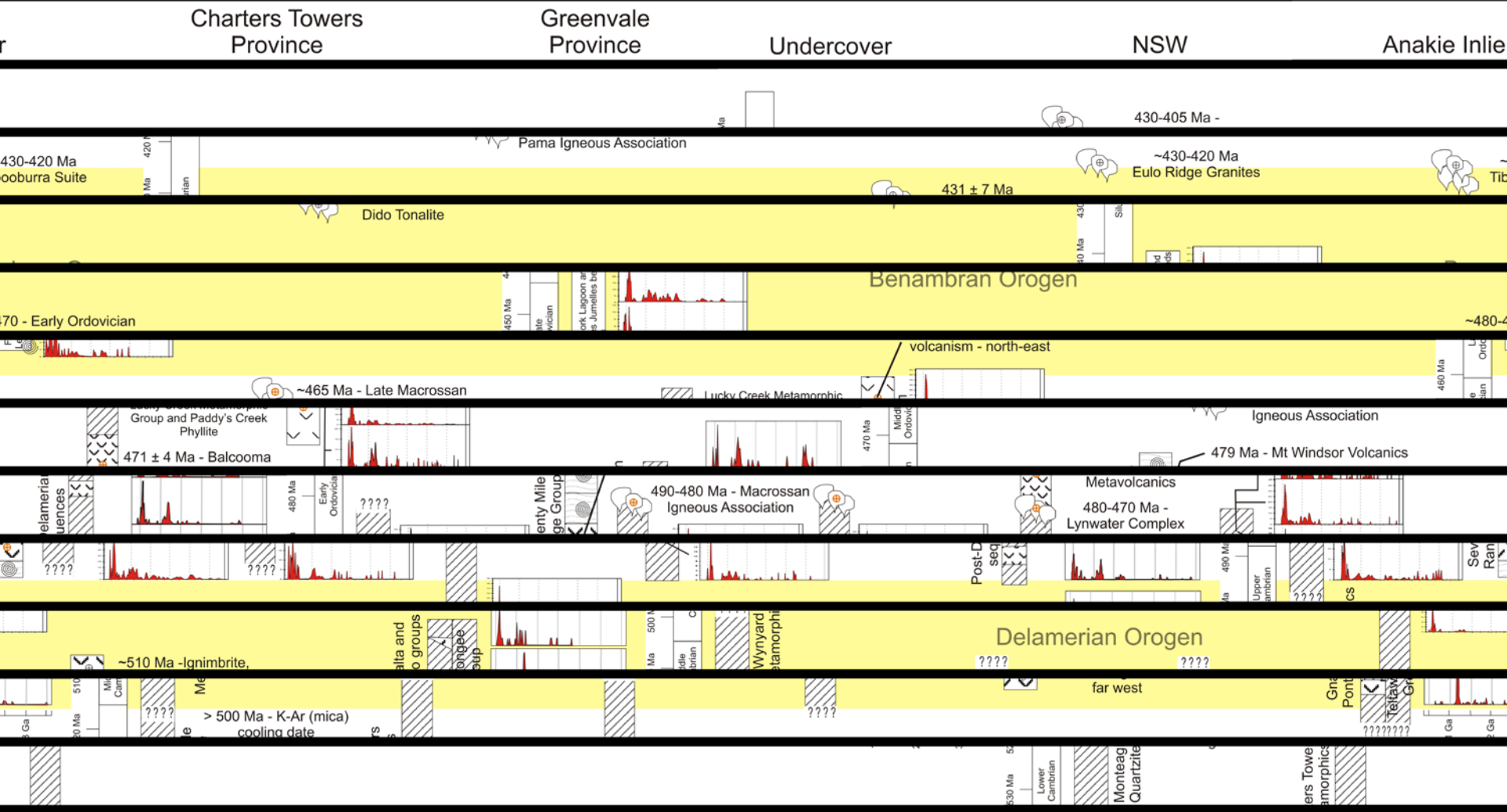


Regional Correlations



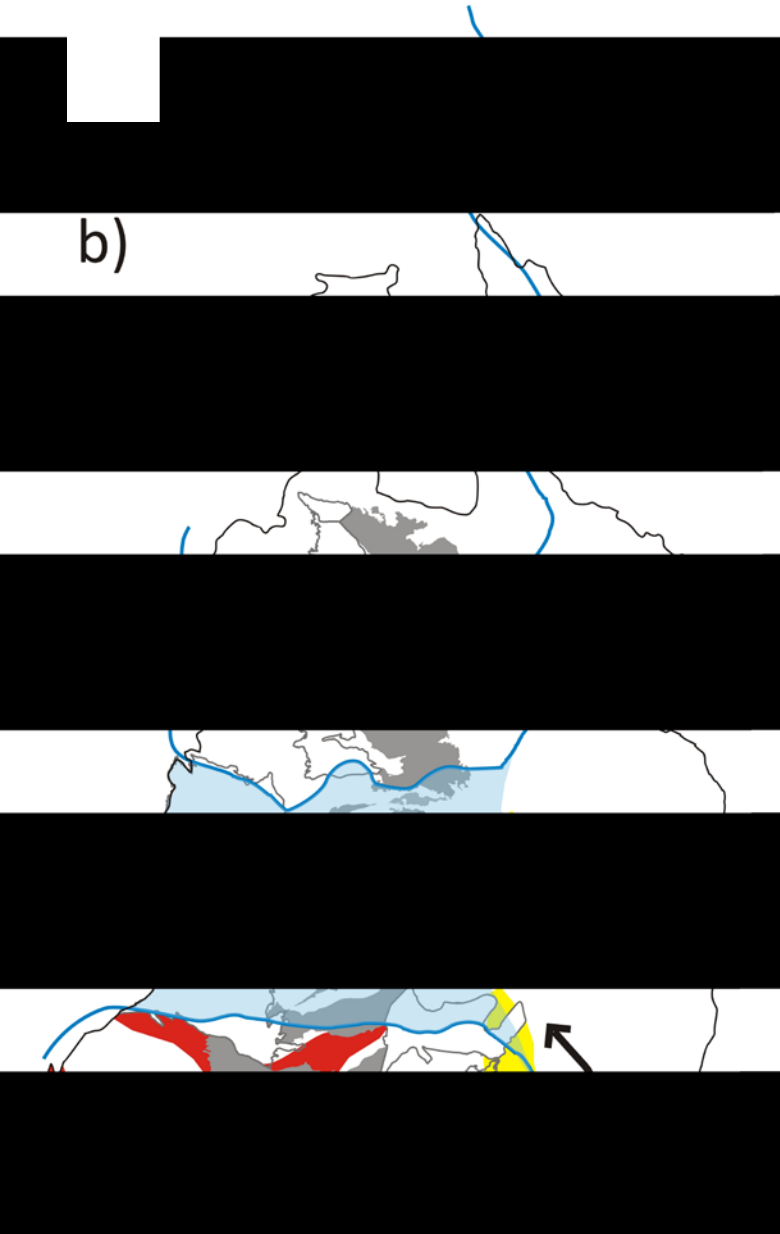
Regional Correlations







Future Work



- The possible sources for the major age peaks are numerous.
- The location of the source plays a key role in the tectonic environment at the time
- To identify source of 'Greenvillean' and ~600-~500 Ma aged zircons through O and Lu/Hf isotopes of detrital sediments.
 - In-situ SHRIMP of grains previously analysed for U-Pb.
- Granite age ranges and source regions;
 - Geochemistry, Sm-Nd whole rock
 - Coralie Siegel, QUT
- Thermal history of the Thomson Orogen;
 - Ar/Ar mica - ~300 degrees
 - U-Th-He zircon – ~200 degrees
- Economic potential:
 - Minerals
 - Geothermal