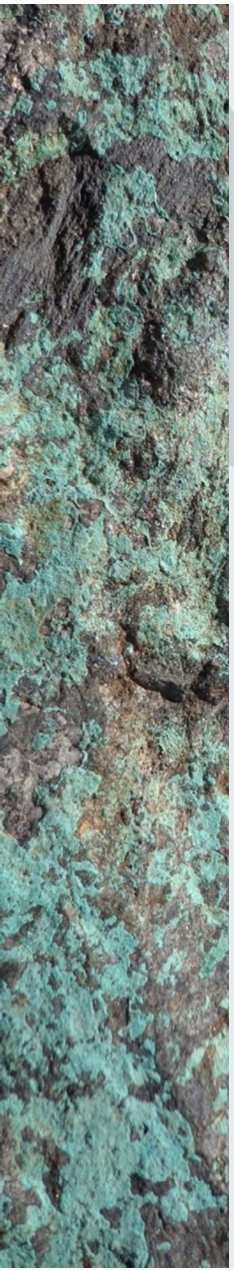


Department of Natural Resources, Mines and Energy

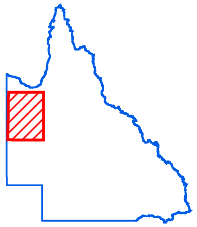
Introduction to the GSQ Mary Kathleen Domain Project

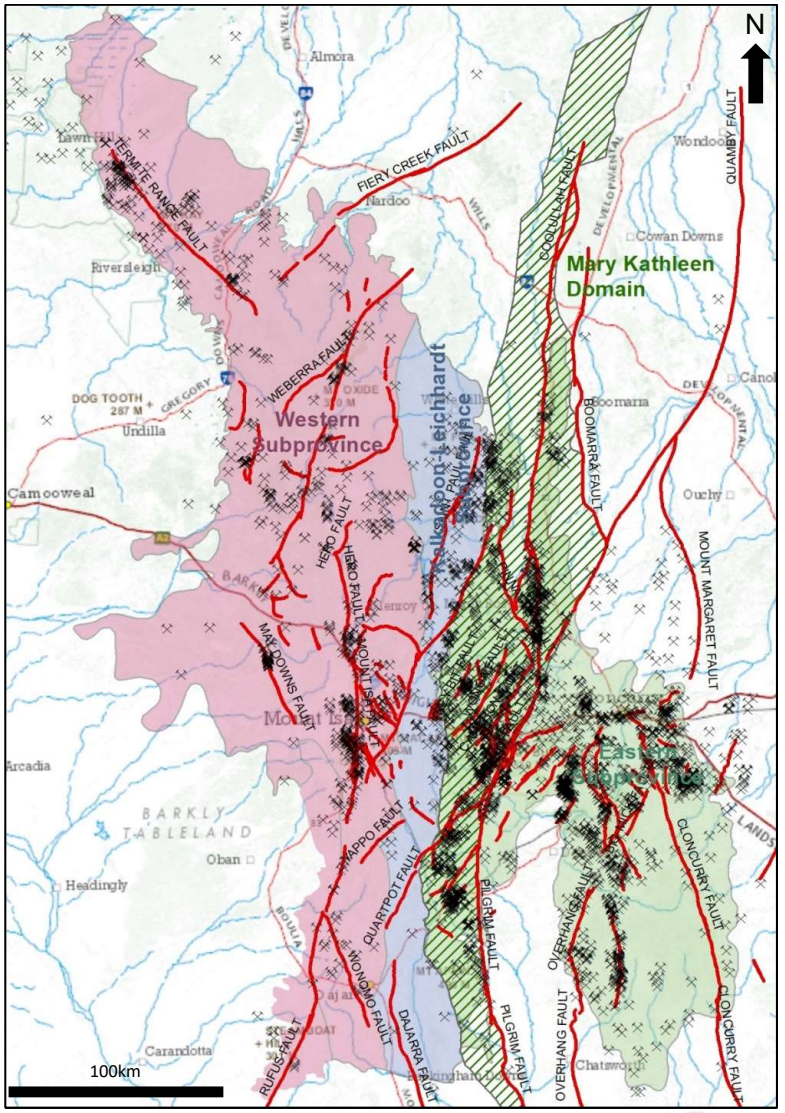
David Purdy
Bob Bultitude
Dominic Brown
Derek Hoy
& JCU Collaborators

Queensland Government

Introduction - MKD

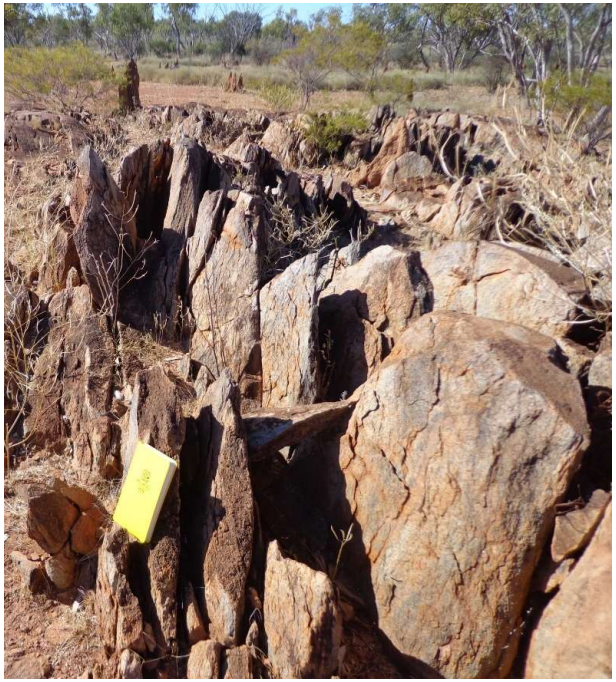
- Western margin of Eastern Succession
- Locally bounded by major faults
- Locally distinctive deformation
- Dominated by Corella Formation and Wonga-Burstall Granites but the geology is complex
- Includes important mineral deposits (Mary Kathleen, Little Eva, Dugald River, Tick Hill)

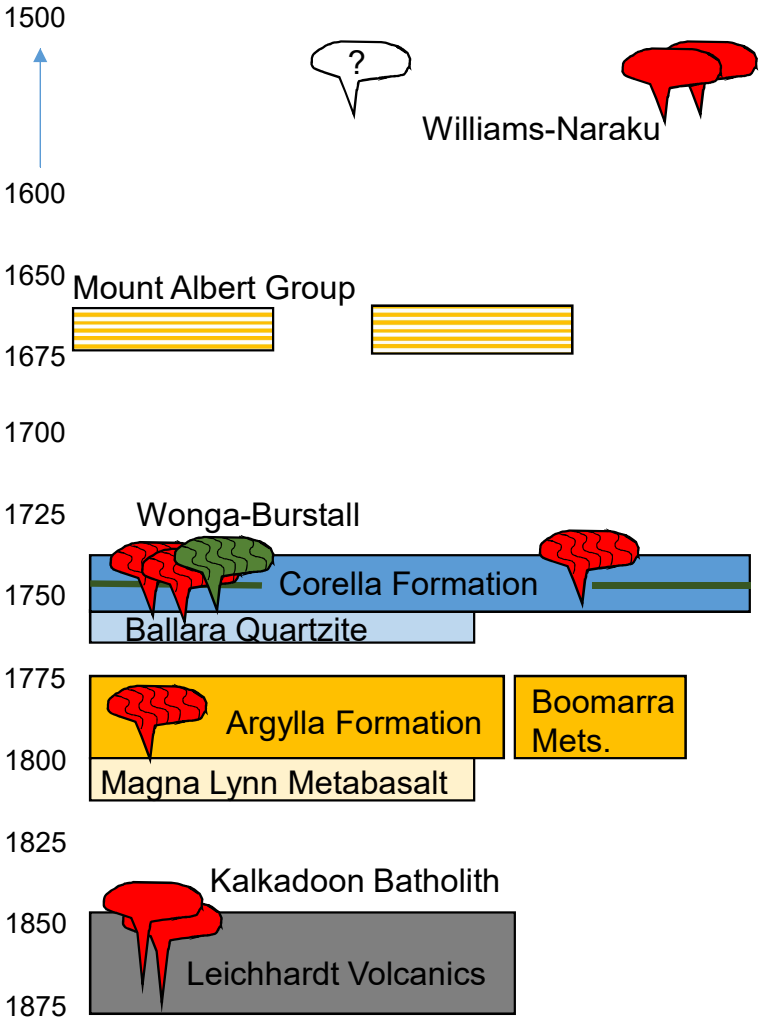


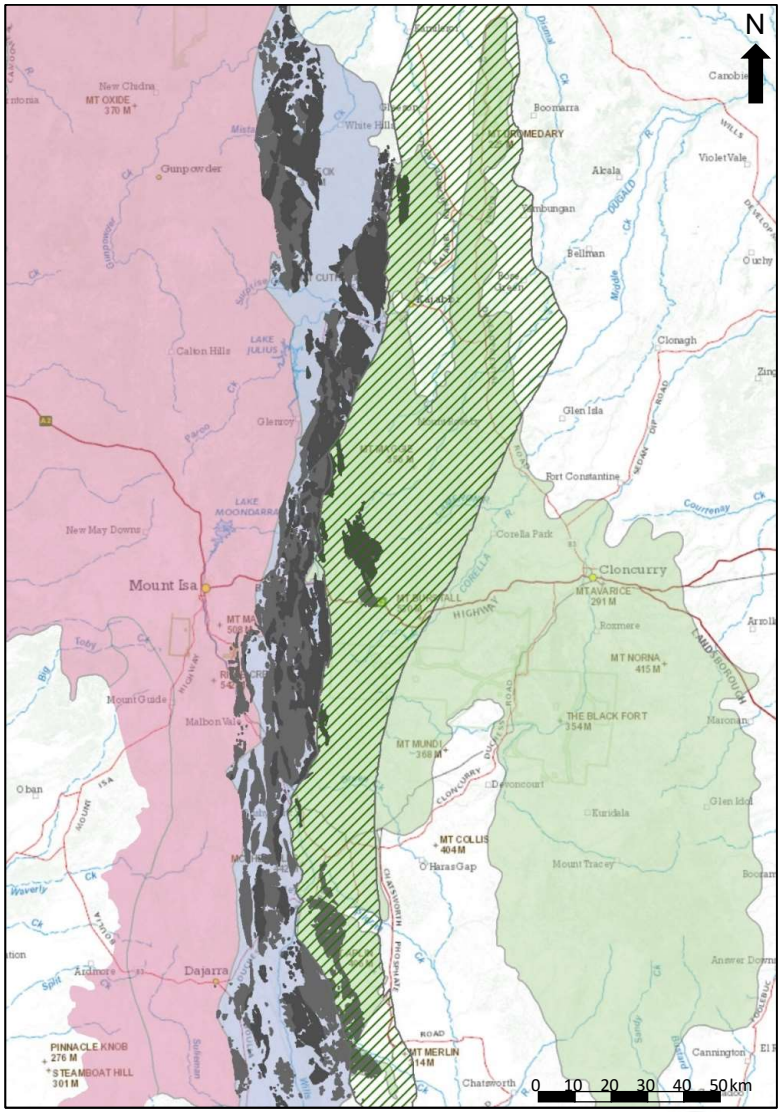


Geology

Leichhardt Volcanics

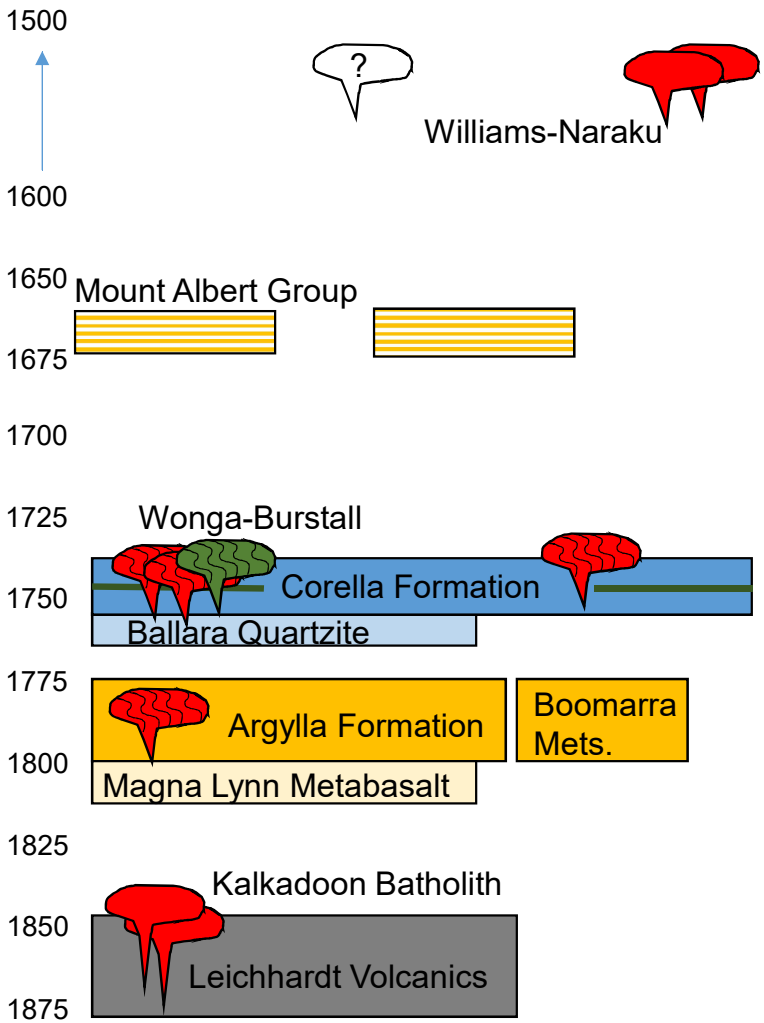


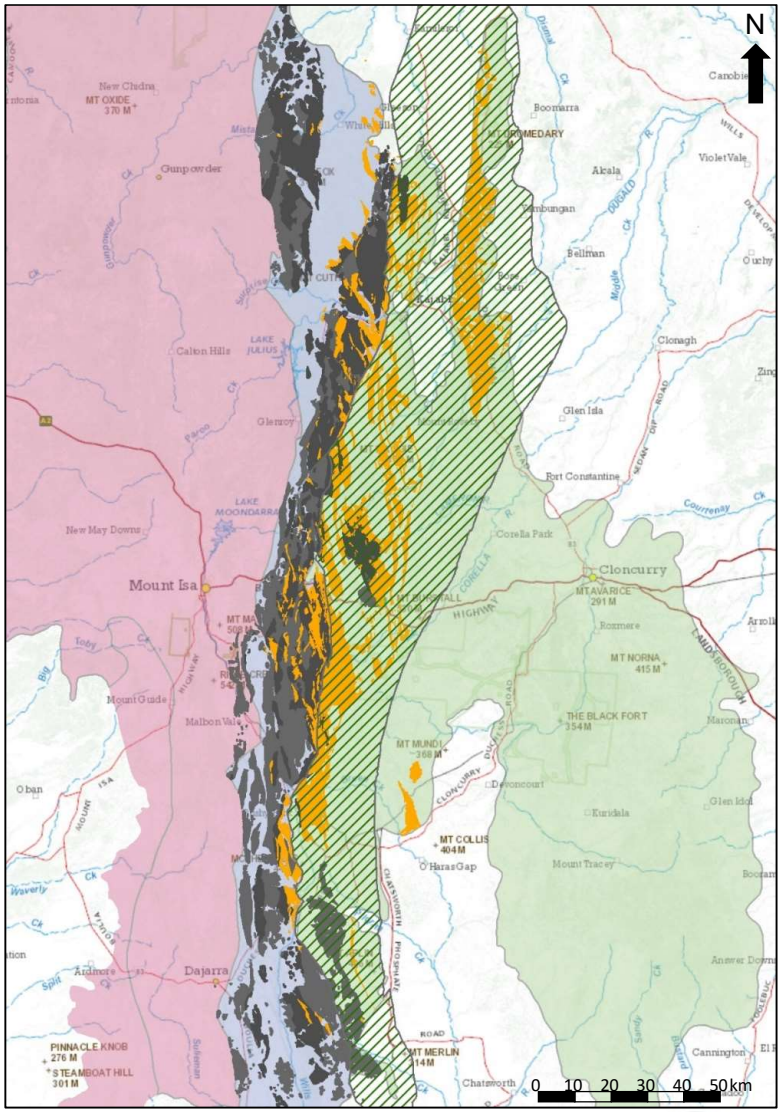




Geology

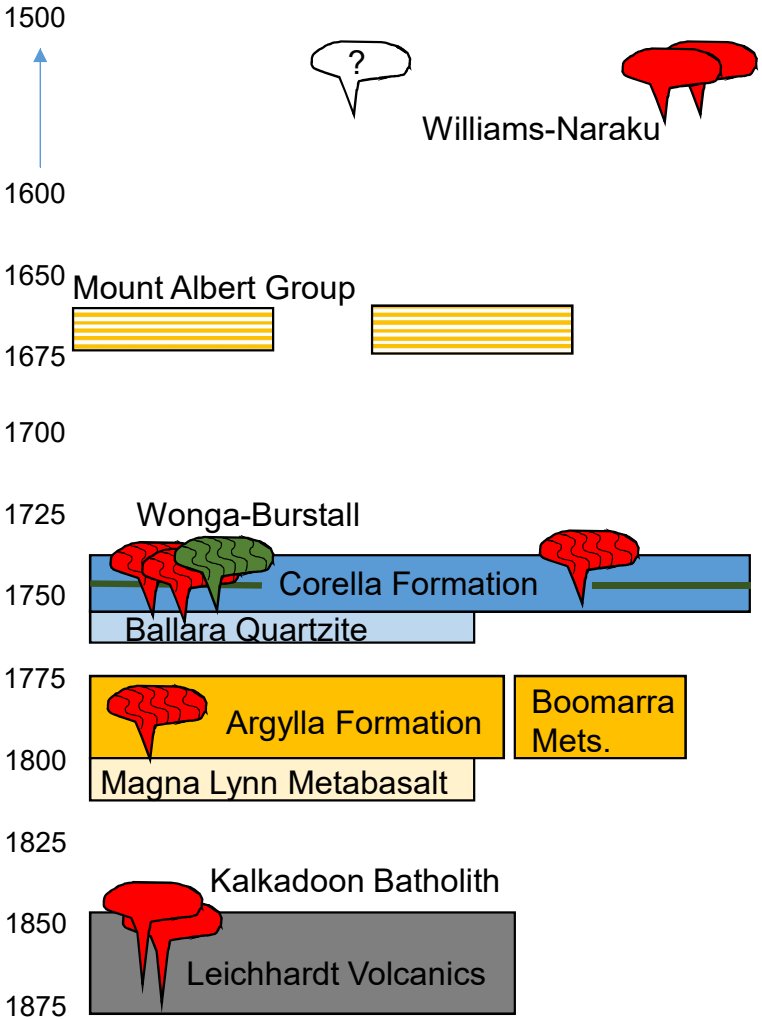
Argylla Formation

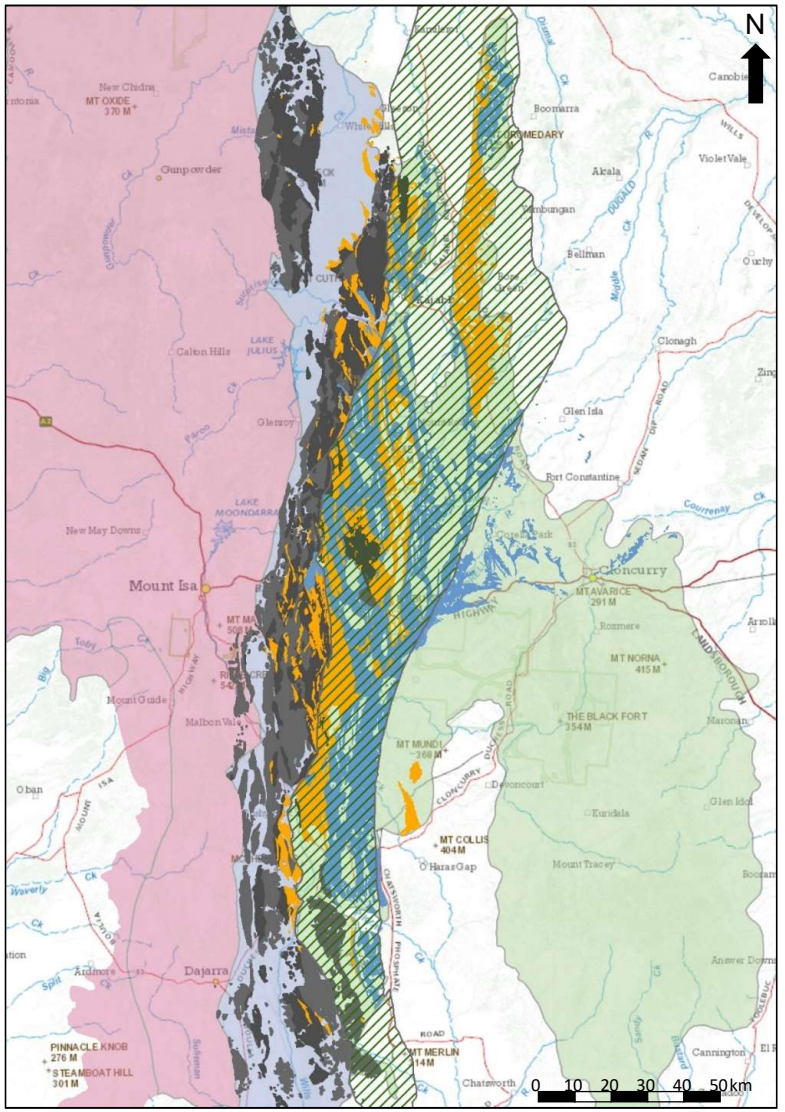




Geology

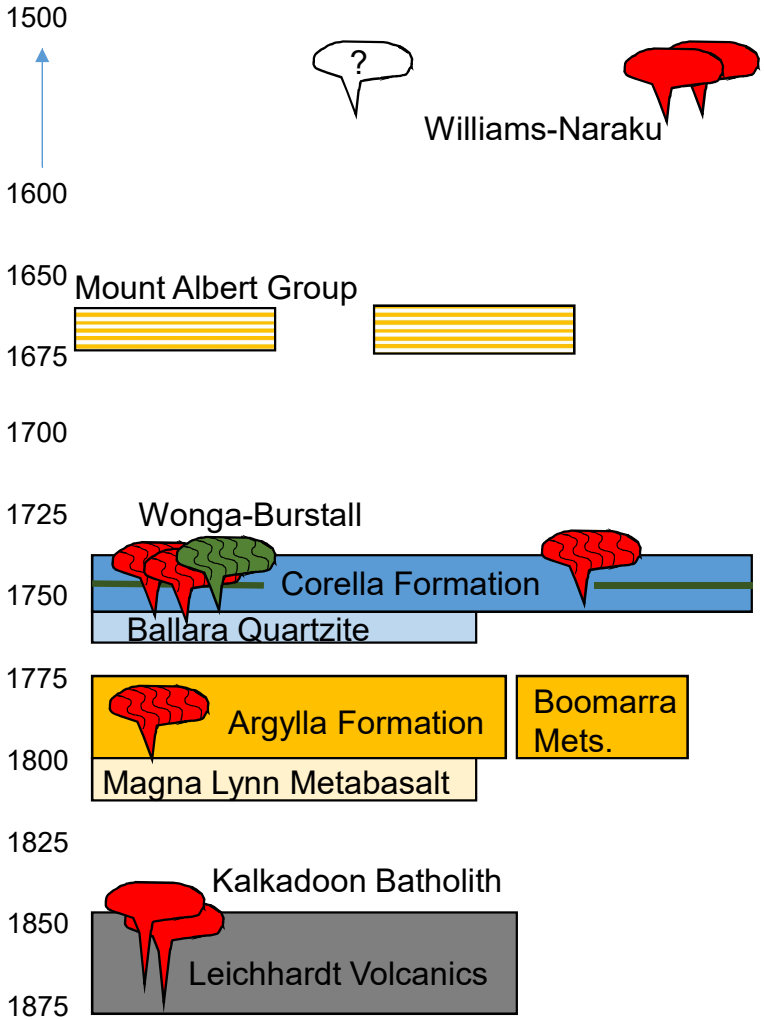
Corella Formation

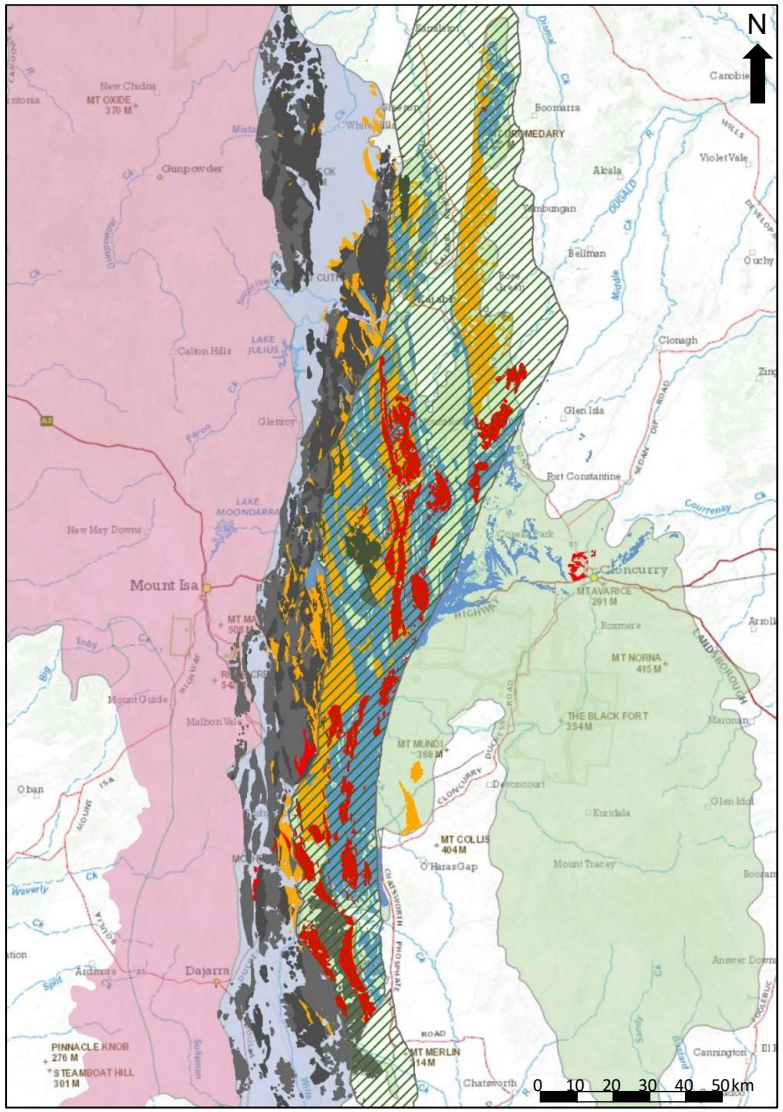




Geology

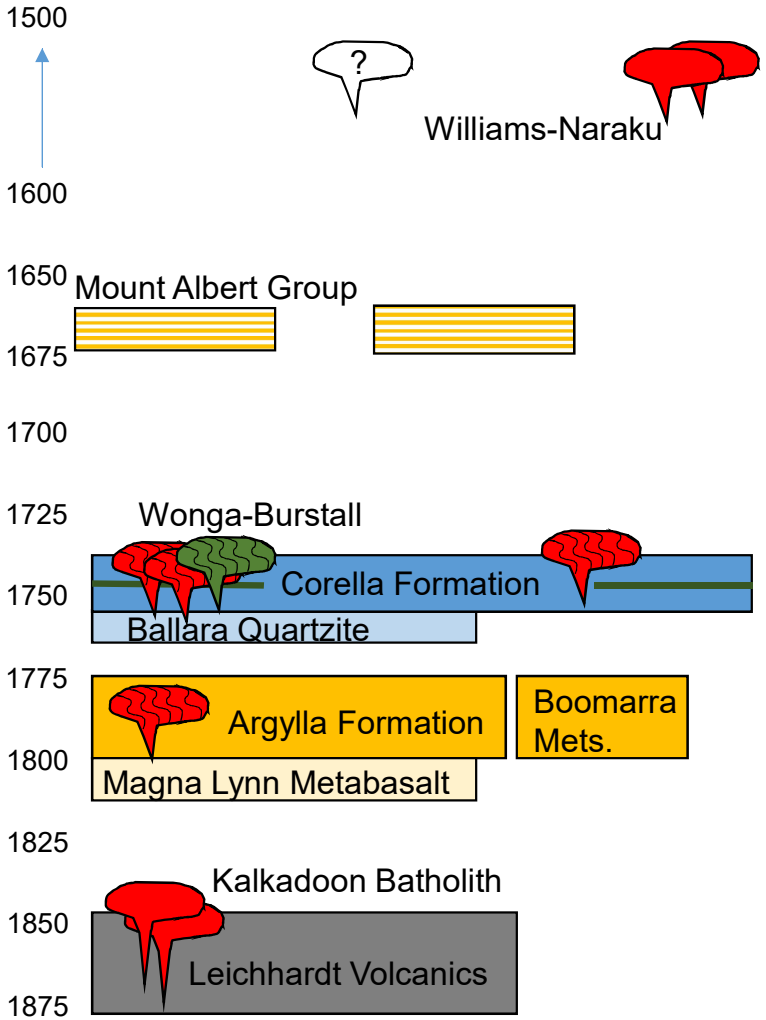
Wonga Granite

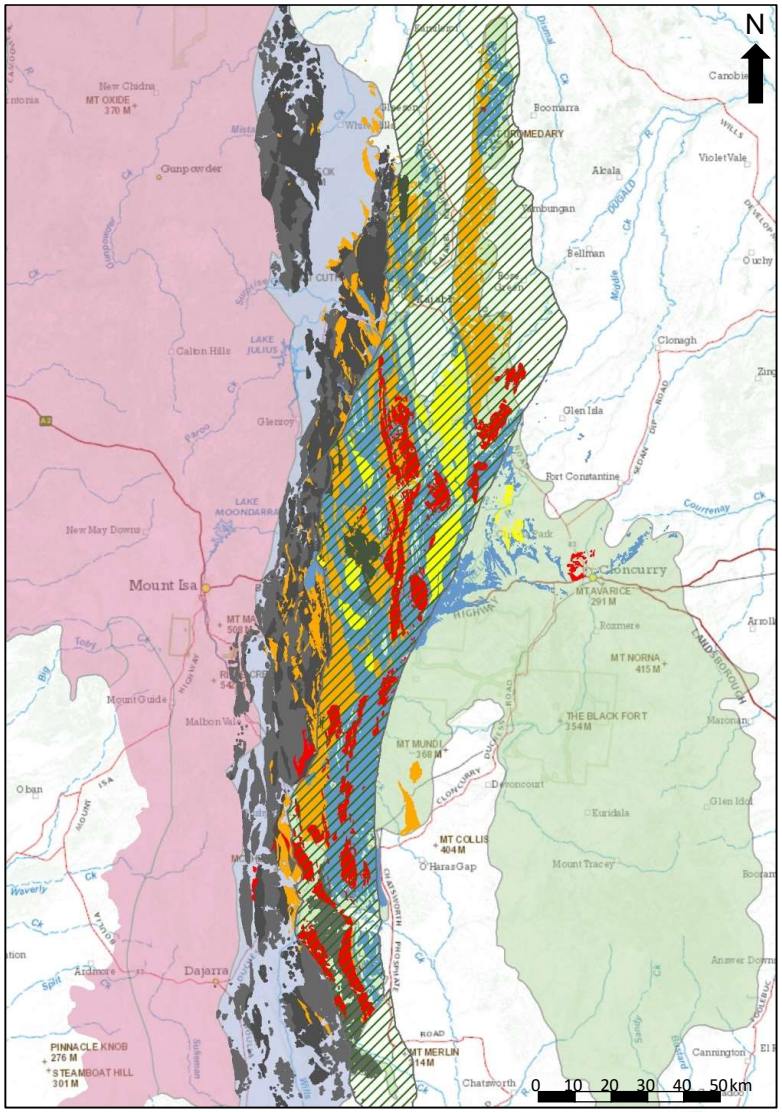




Geology

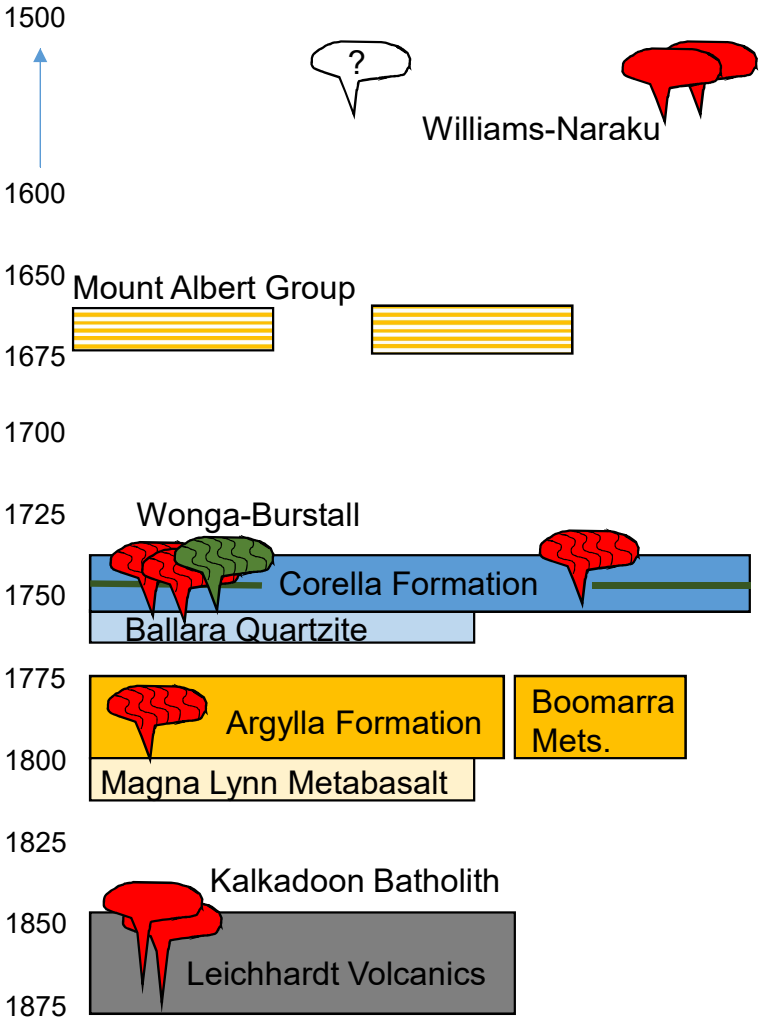
Mount Roseby Schist

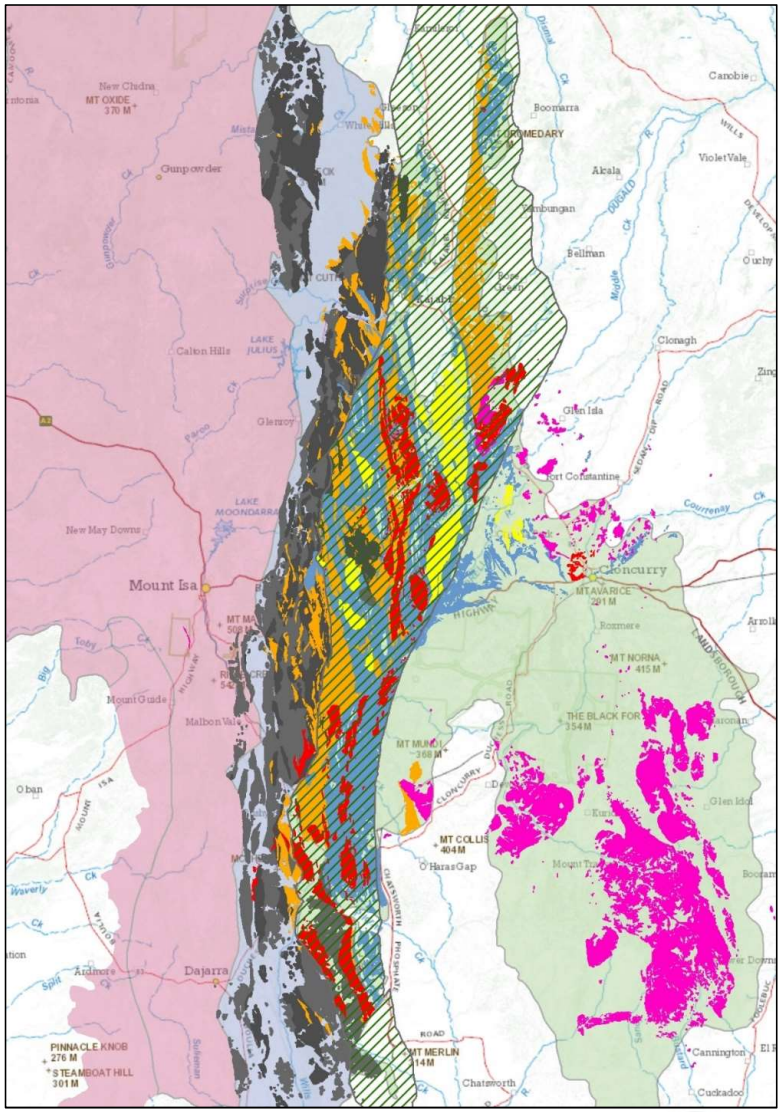




Geology

Malakoff Granite





Rationale

- Mineralisation in and around the MKD variably suggested to be associated with felsic magmatism and mafic magmatism
- Certain ages are favored (1540-1500 Ma)
- Poorly constrained in the MKD
- Existing mapping/stratigraphic problems
- Opportunity to collaborate with the JCU research team
- Support other GSQ projects

Objectives

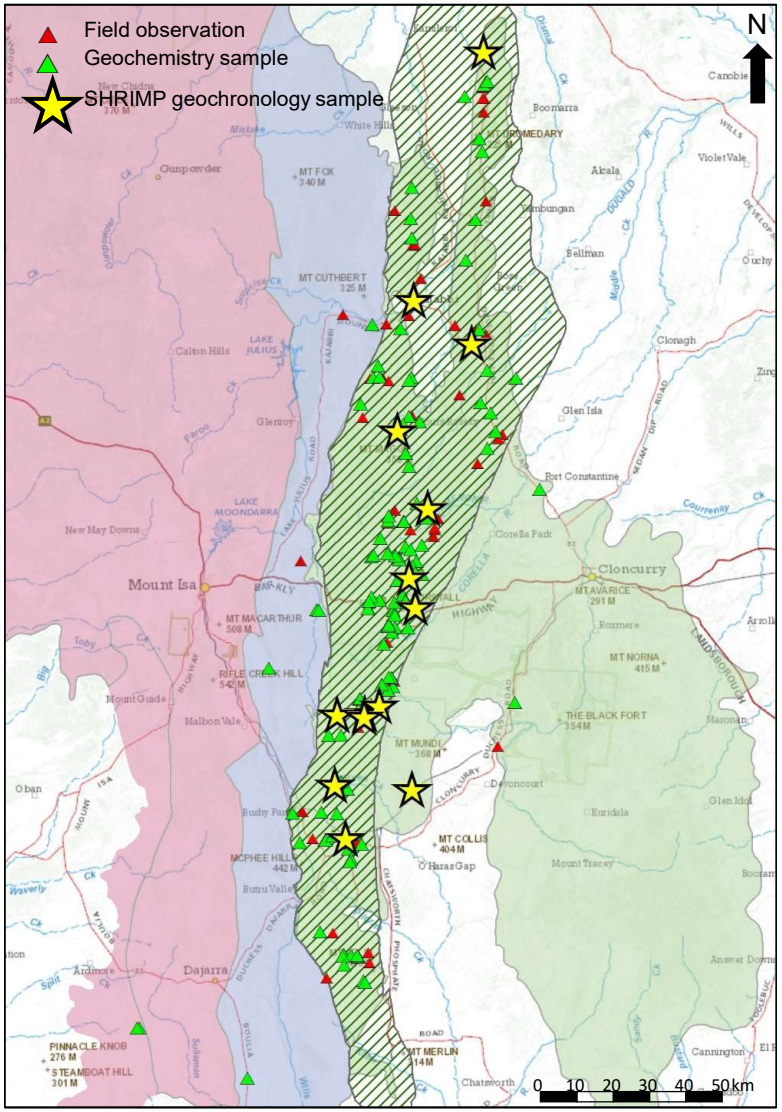
- Provide an updated regional framework of magmatism in collaboration with JCU
- Define magmatic groups (age, geochemistry, spatial distribution)
- Investigate comagmatic felsic igneous rocks in the Corella Formation
- Establish a U-Pb, O and Lu-Hf isotopic framework for magmatic rocks
- Place undercover geology into the updated regional framework
- Support other projects (hydrogeochemistry, geophysics acquisition)

Work Program

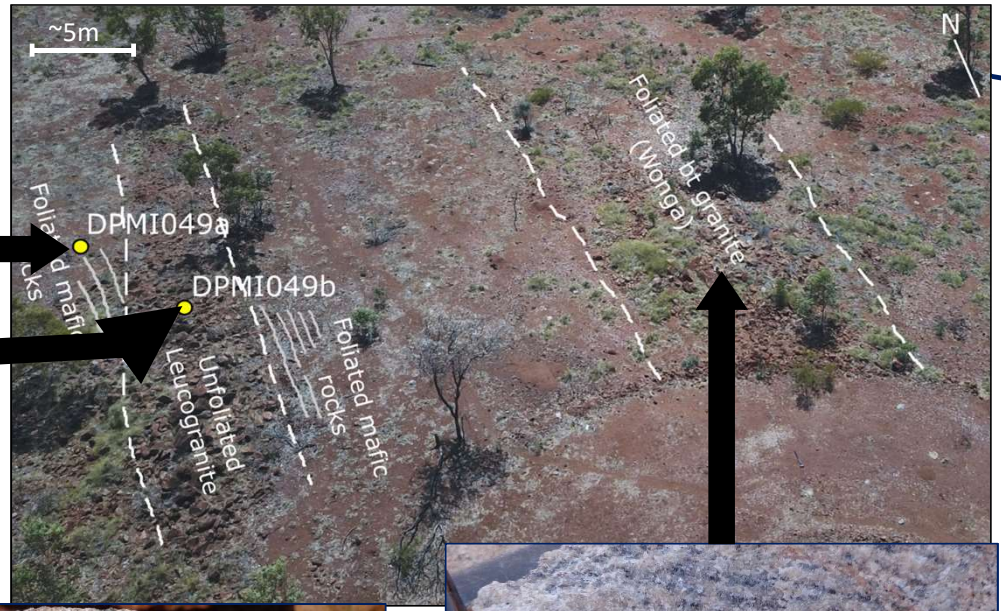
1. Updating the stratigraphic/magmatic framework
    - Field mapping/sampling, geochemistry, geochronology, petrography -> petrogenesis
    - Mafic rocks study
2. Northern extension undercover
    - Geochronology and geochemistry of drill core material, geophysical interpretation
3. Solid geology interpretation of Cloncurry North geophysics
4. O and Hf Isotope study (GA Collaboration)

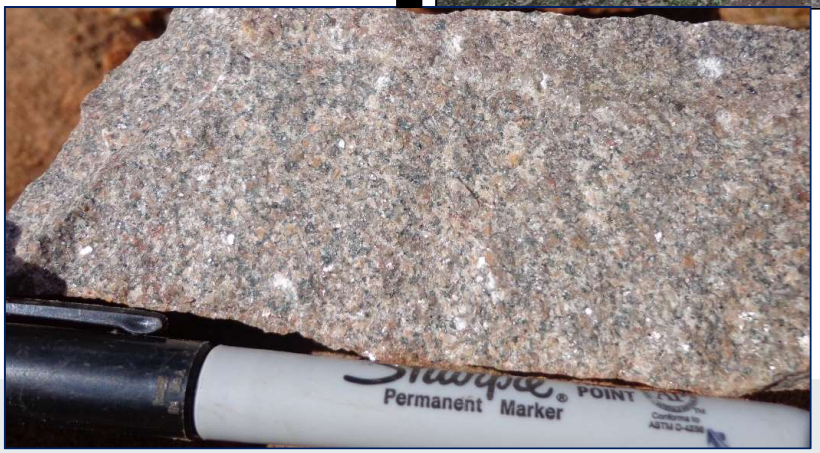
Magmatic and stratigraphic Framework

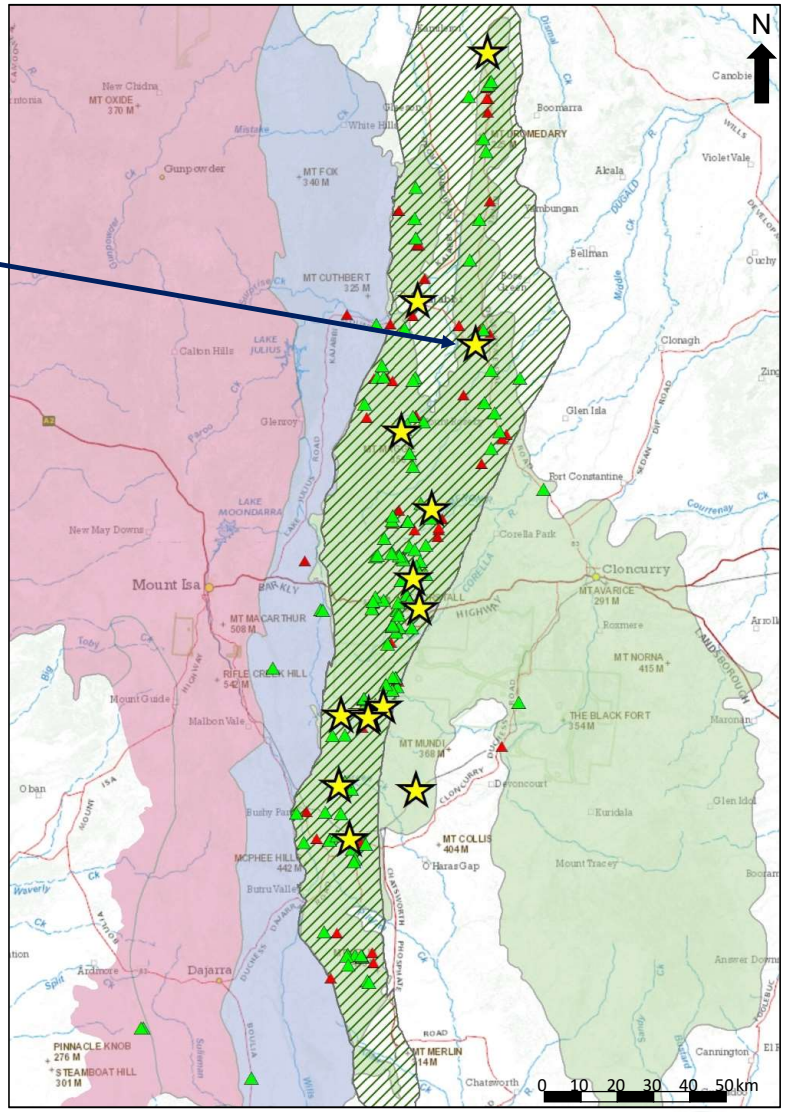
- Fieldwork – observations throughout the Domain
- Geochemistry – 180 whole rock analyses
- Geochronology – 14 SHRIMP samples



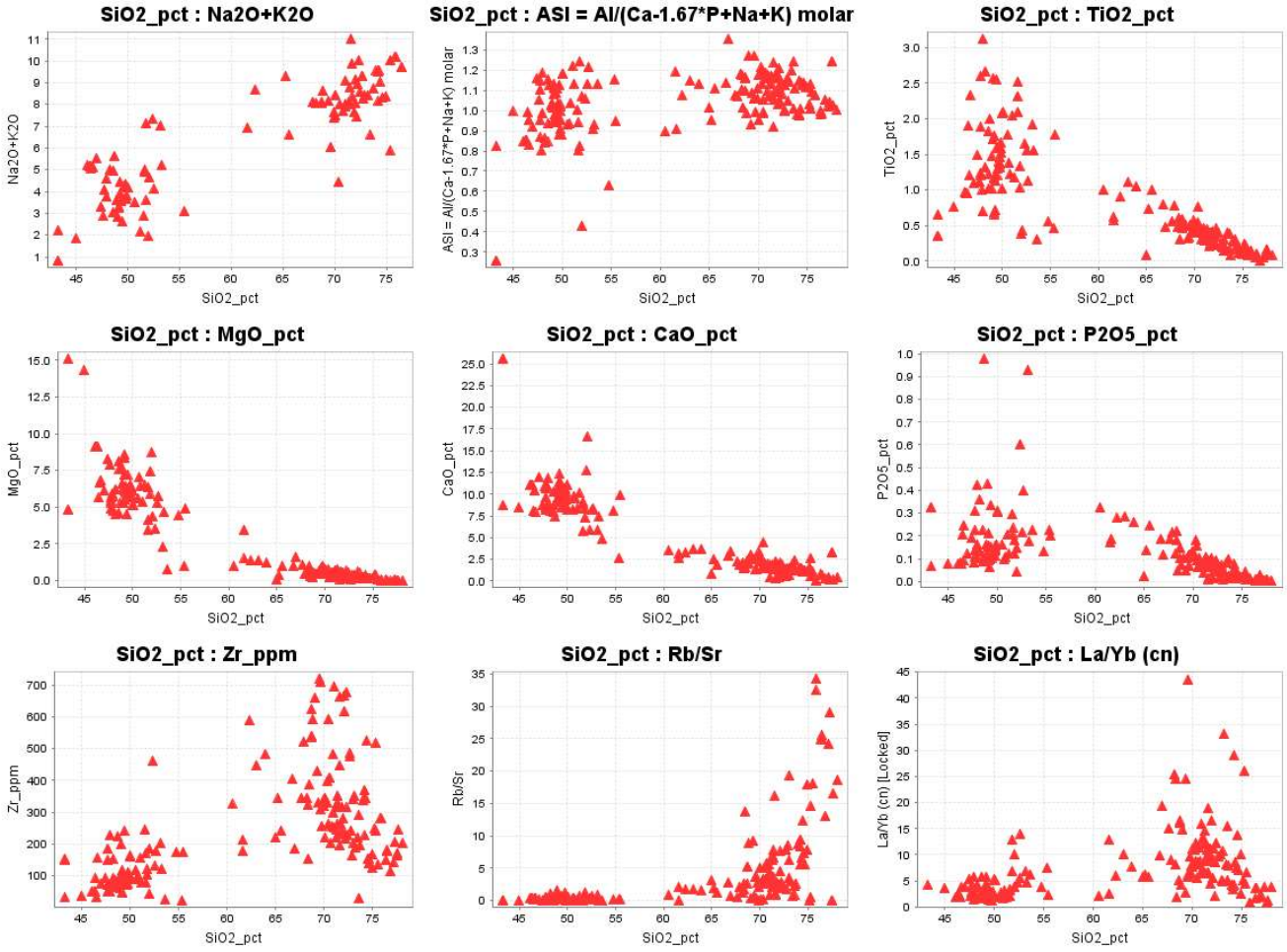
Geochronology sampling

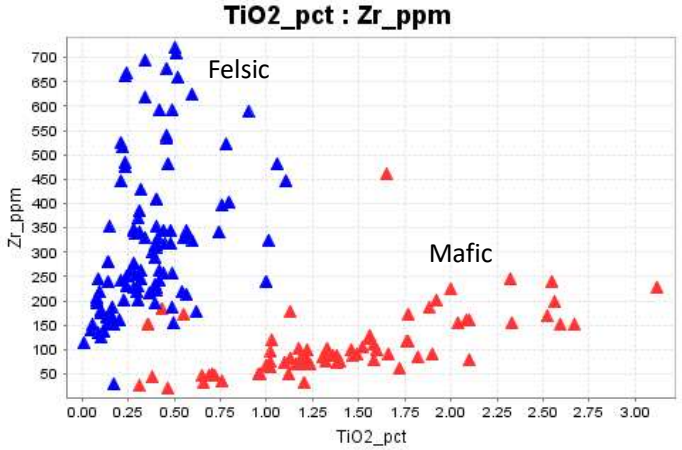




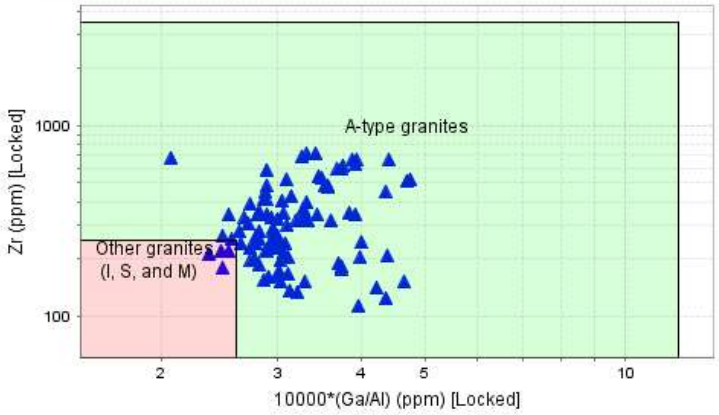


Petrography and geochemistry





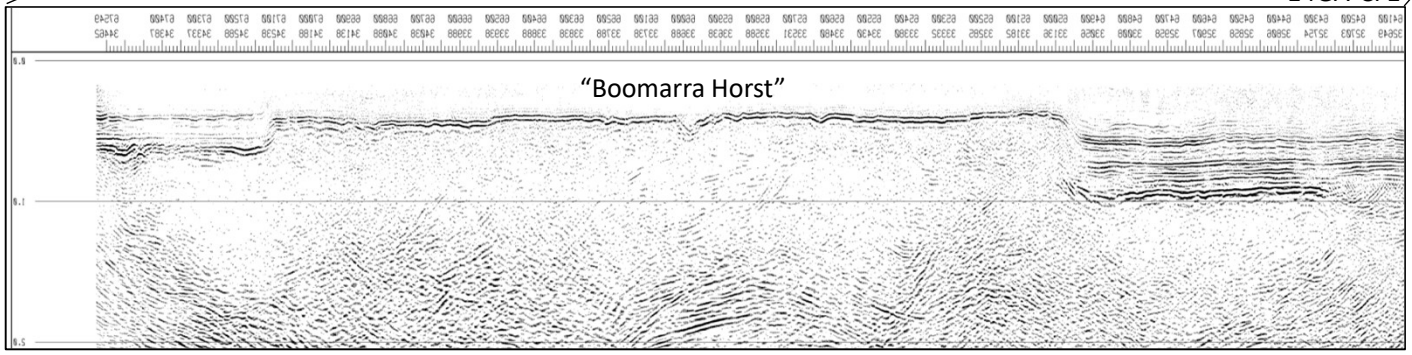
A and I-S-M-type Granite Differentiation using Zr (Whalen et al, 1987)

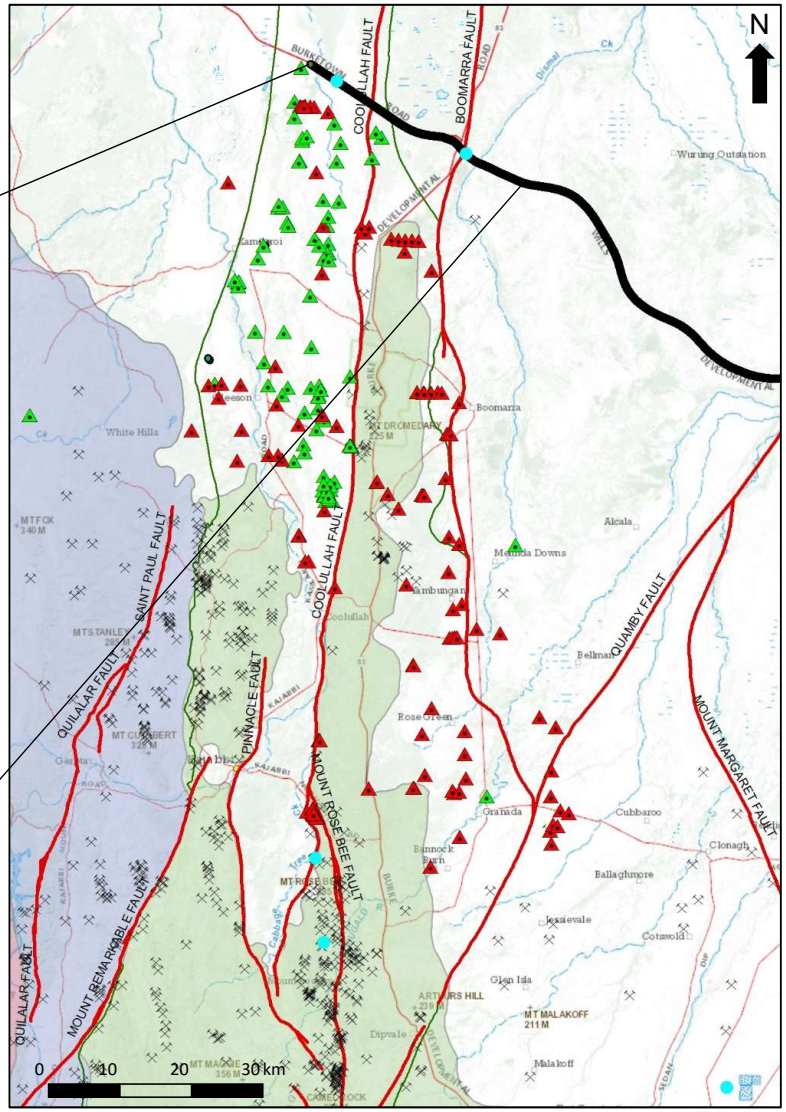


MKD Undercover

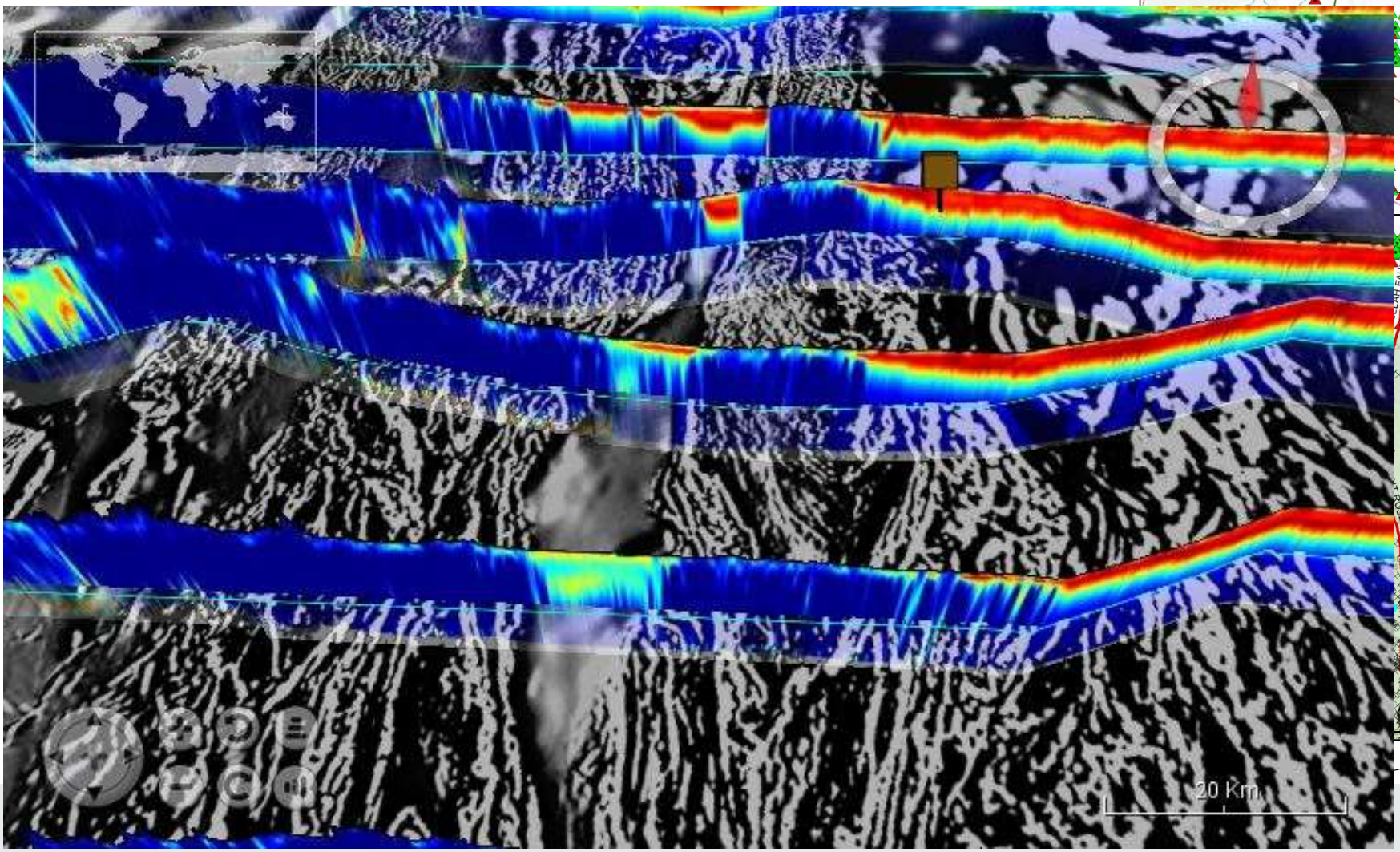
Two different basins cover the northern MKD

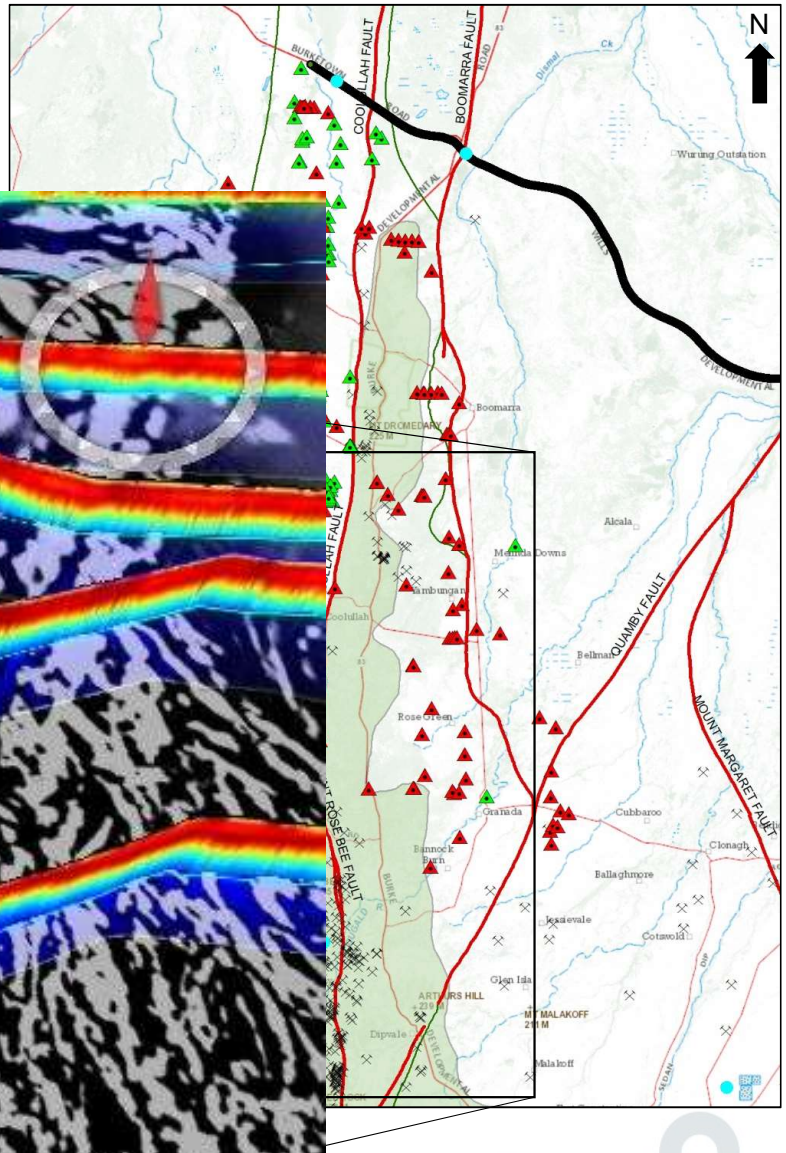
1) Horst-Graben associated with Carpentaria Basin
2) Landsborough ‘Graben’
   - Pull apart basin
   - Cambrian
   - No drilling
   - Unknown depth
   - Mineralisation potential



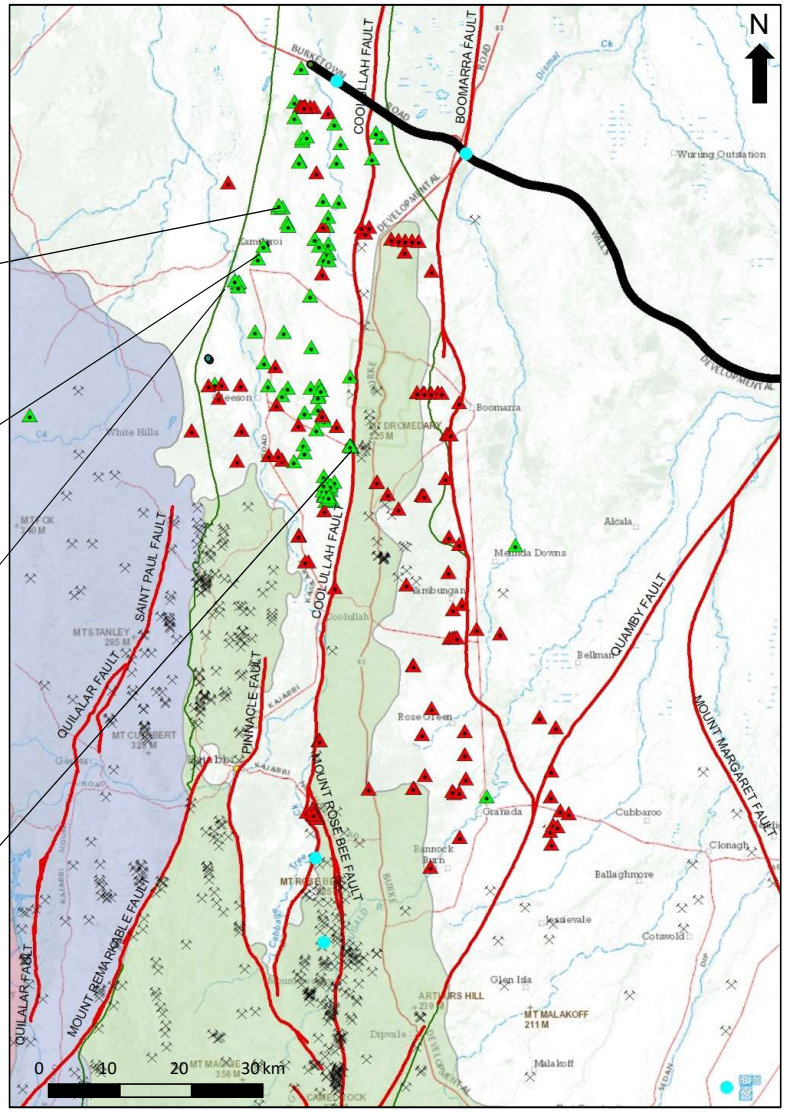


MKD Undercover





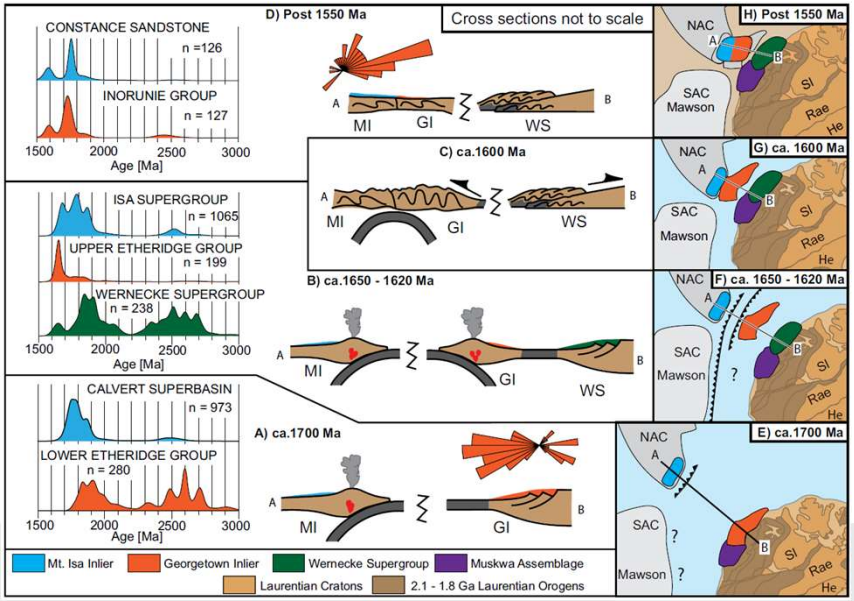
Drill core sampling



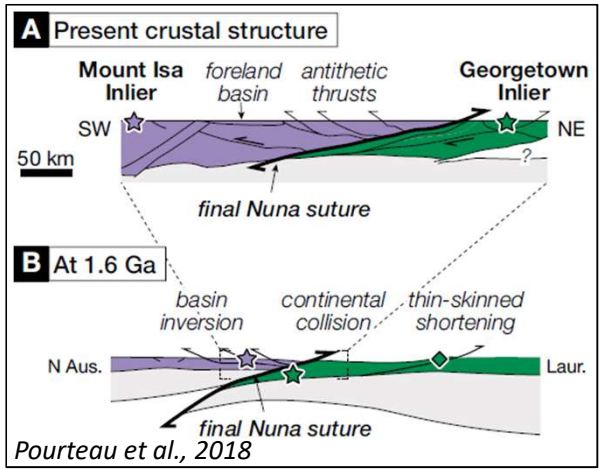
U-Pb, O and Lu-Hf isotopes in zircons

- Petrogenesis
- Location and timing of mantle input, craton margins
- Testing lithosphere-scale hypotheses

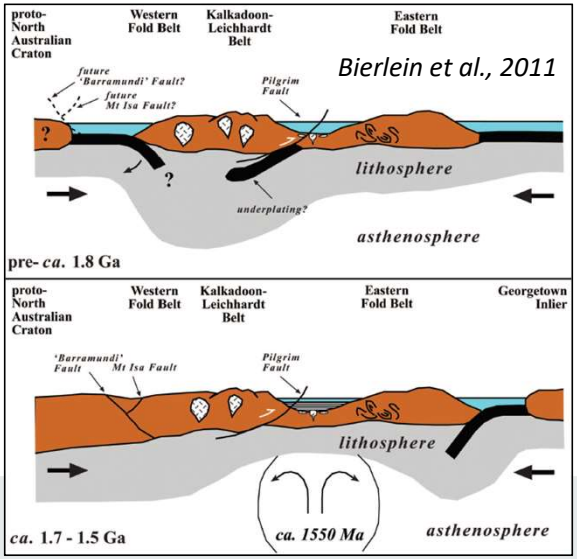
Nordsvan et al., 2018

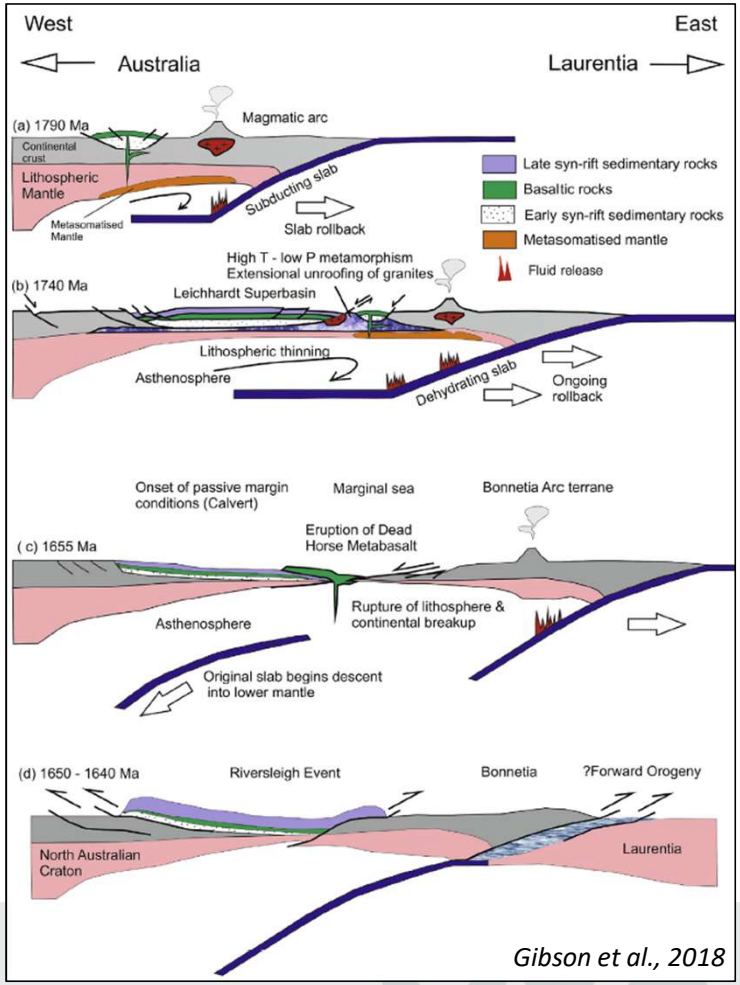


Pourteau et al., 2018



Bierlein et al., 2011

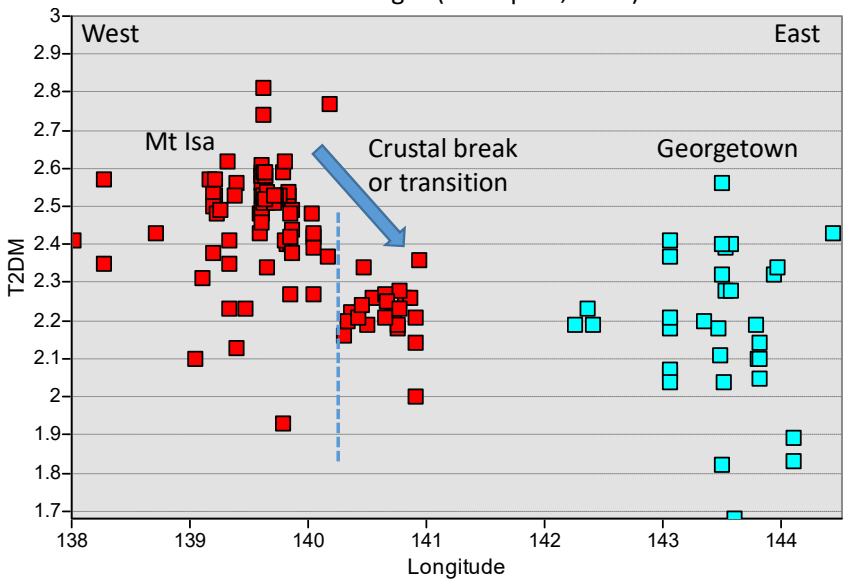


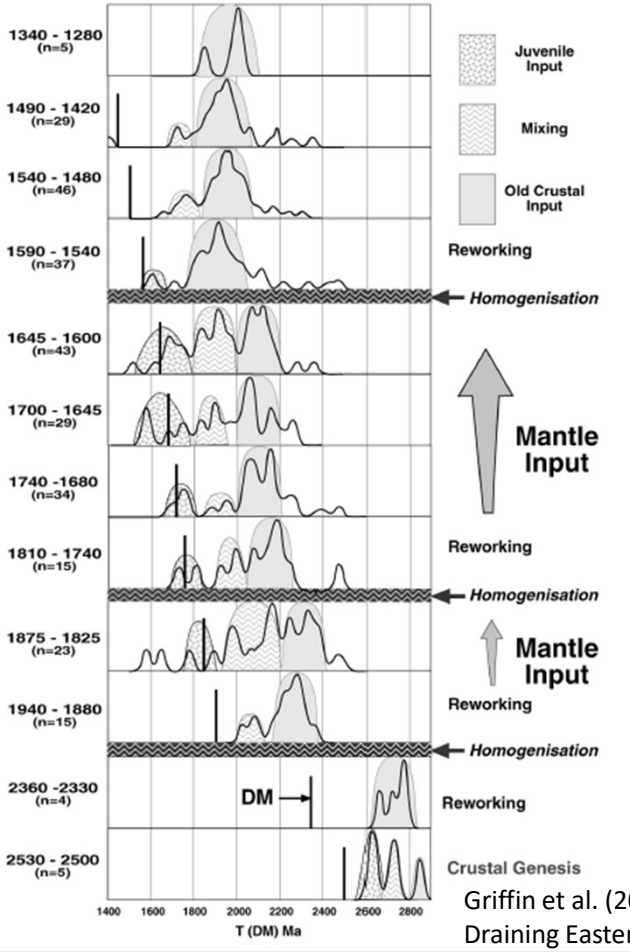


Gibson et al., 2018

U-Pb, O and Lu-Hf isotopes in zircons

Nd model ages (Champion, 2013)





Griffin et al. (2006) Modern seds. Draining Eastern Succession

Summary

- GSQ are working on a regional geology project in the Mary Kathleen Domain
- Collaborating with JCU researchers
- Main aim is to get a better understanding of the regional magmatism
- Extending that knowledge into covered areas

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