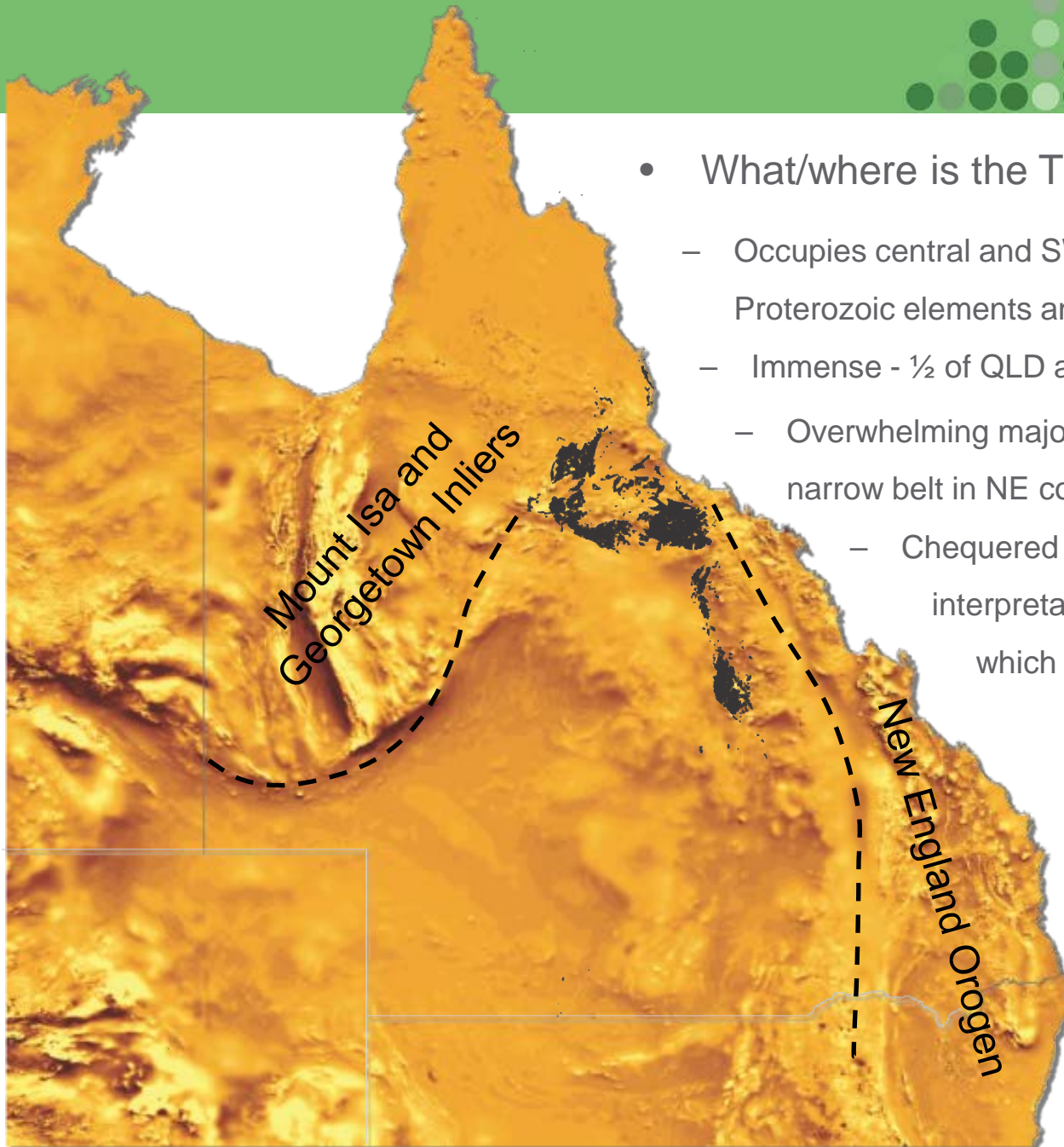


Thomson Orogen

Introduction to the geology
and a new GSQ project

Dave Purdy and Dominic Brown (Minerals Group GSQ)



- What/where is the Thomson Orogen?
 - Occupies central and SW part of QLD between Proterozoic elements and New England Orogen
 - Immense - $\frac{1}{2}$ of QLD and $\sim 1\,000\,000\text{km}^2$ total
 - Overwhelming majority is covered, o/c limited to narrow belt in NE corner
 - Chequered history of definition and interpretation in terms of boundaries and which outcropping units are included

Thomson Orogen

– interpretations of distribution

- Our work will simply focus on rocks that form basement and what they have to offer



Thomson Orogen
Draper, 2006

Today's presentation

- Overview of what we know about the Thomson Orogen
- Remaining questions
- Our contribution





What we know geologically - Outcrop

Reedy Springs Batholith

Lolworth Batholith

● Hughenden

■ Camb-Ord metamorphics
■ Neopro-Camb metamorphics
■ Ord-Dev intrusive units

100km



Fork Lagoons Beds



Scurvy Ck. Meta-arenite (Anakie)





What we know geologically - Outcrop

Reedy Springs Batholith

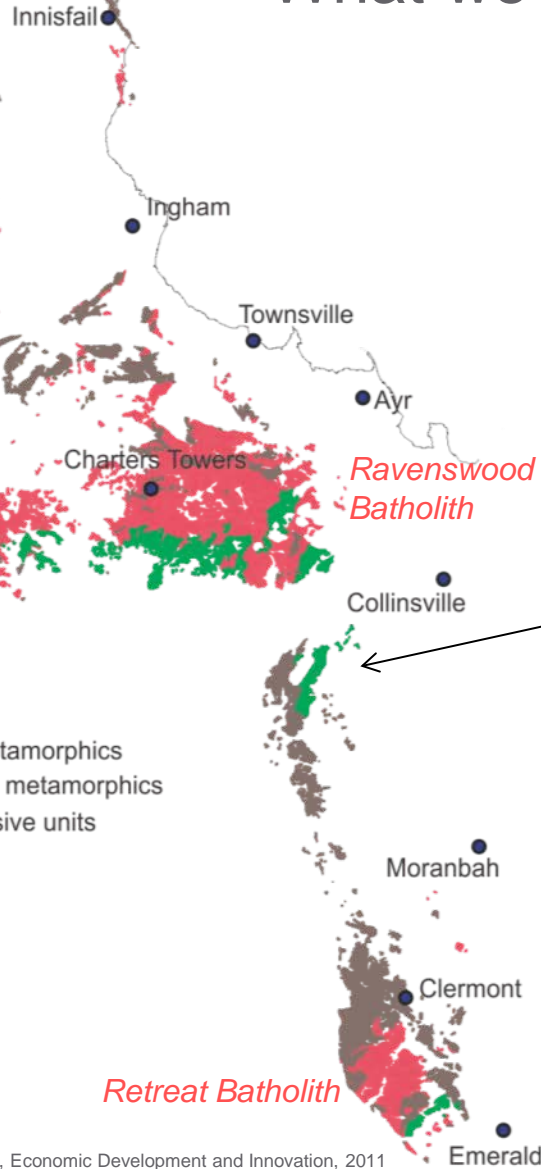
Lolworth Batholith

Ravenswood Batholith

Retreat Batholith

- Camb-Ord metamorphics
- Neopro-Camb metamorphics
- Ord-Dev intrusive units

100km



Les Jumelles beds

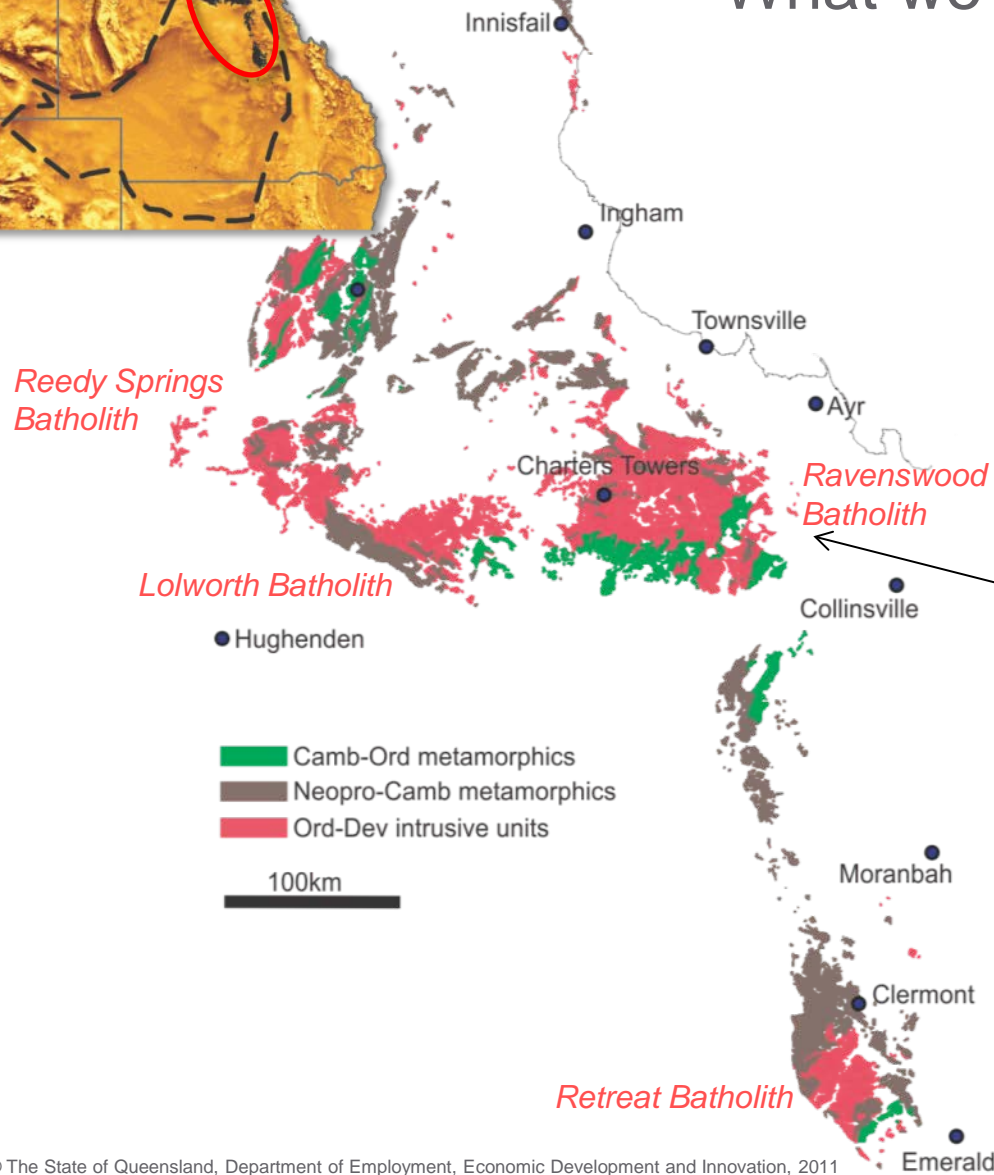


Anakie Metamorphic Gp.





What we know geologically - Outcrop



Puddler Creek Fm.

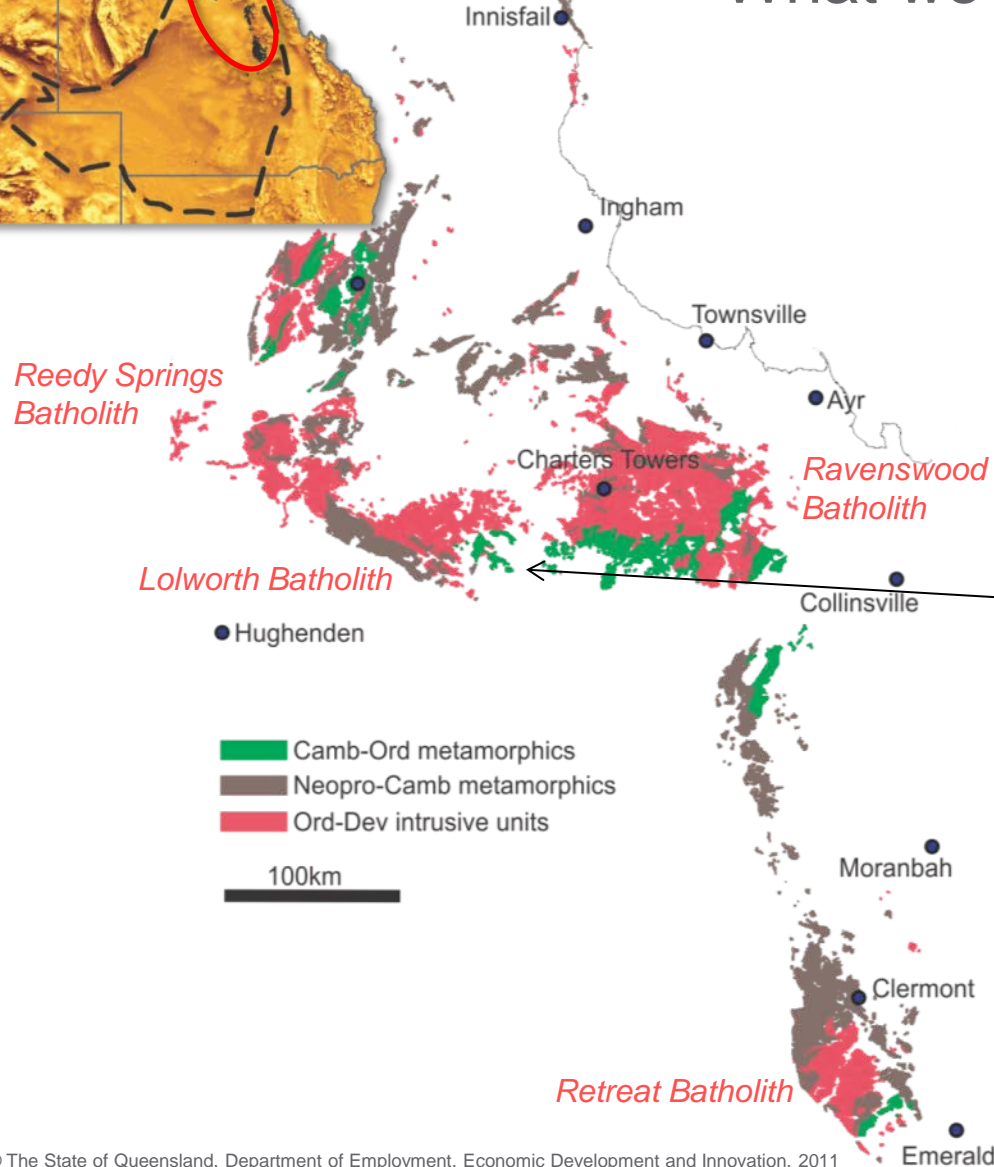


Charters Towers Metamorphics





What we know geologically - Outcrop



Mount Windsor Volcanics



Cape R. Metamorphics





What we know geologically - Outcrop

Reedy Springs Batholith

Lolworth Batholith

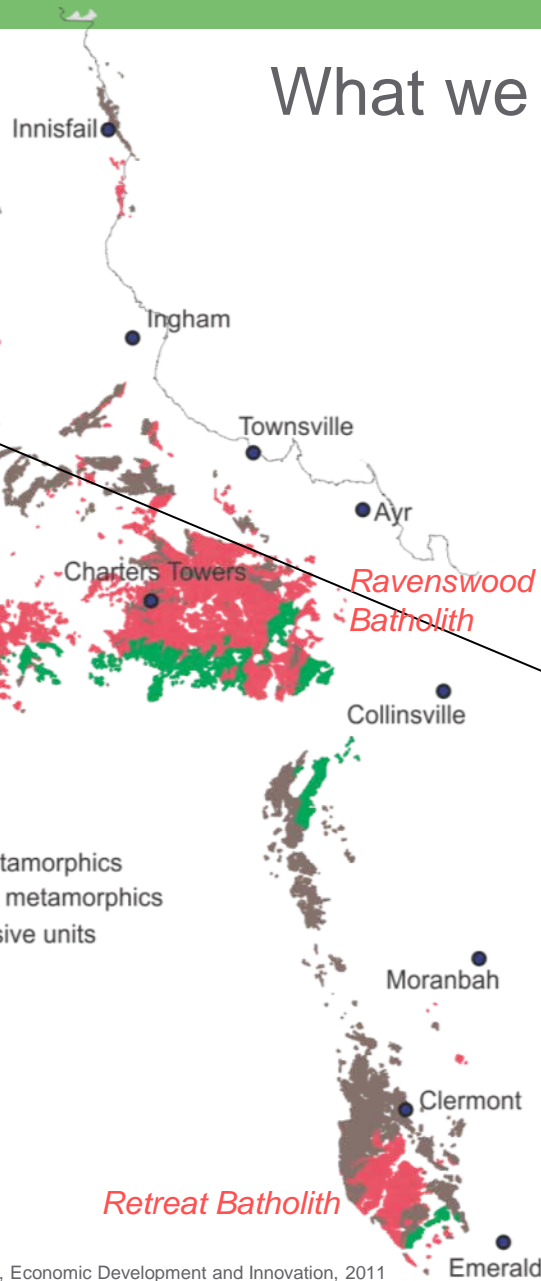
Ravenswood Batholith

Retreat Batholith

● Hughenden

- Camb-Ord metamorphics
- Neopro-Camb metamorphics
- Ord-Dev intrusive units

100km



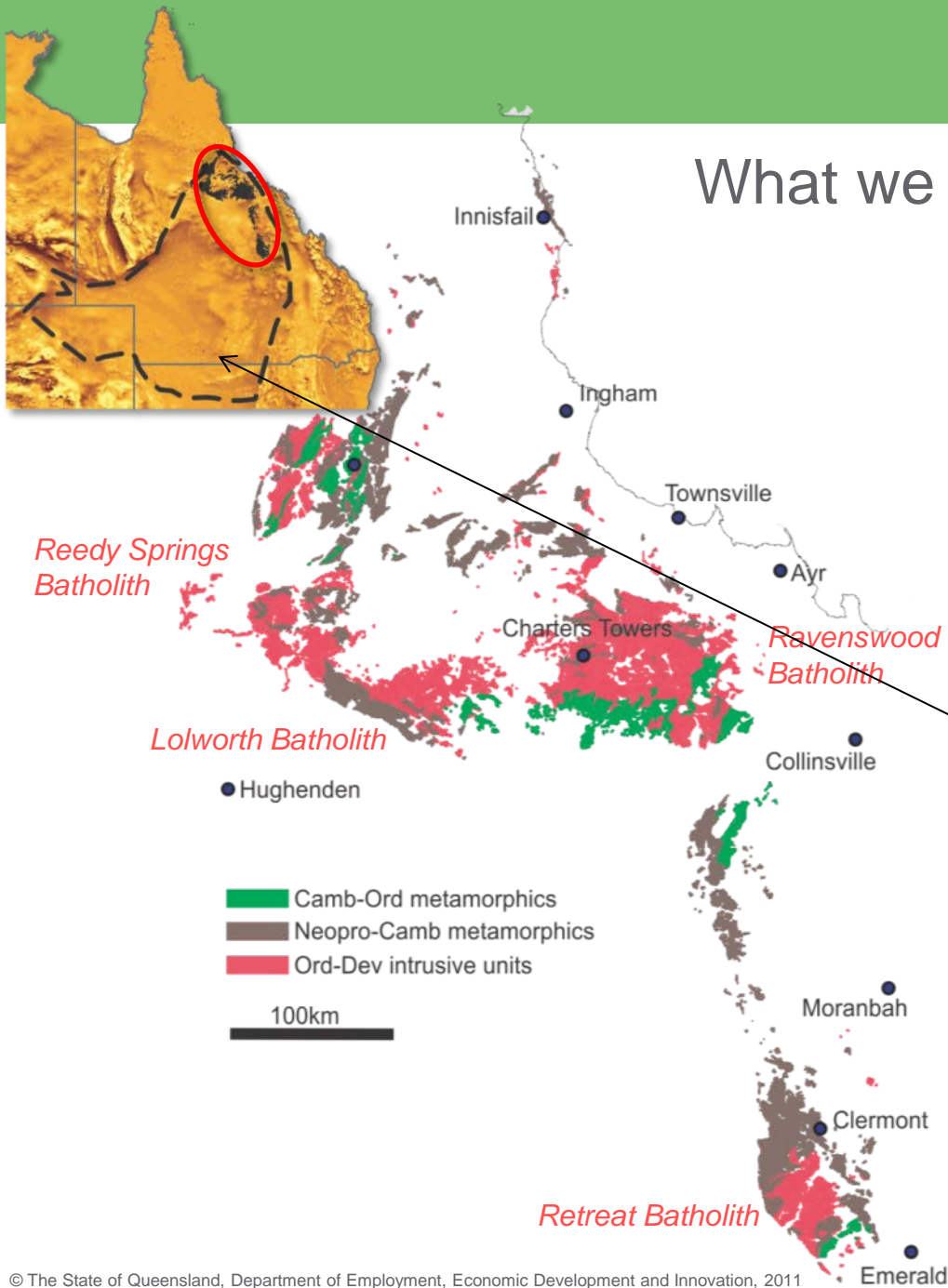
Balcooma Metavolcanics



Oasis Metamorphics



What we know geologically - Outcrop

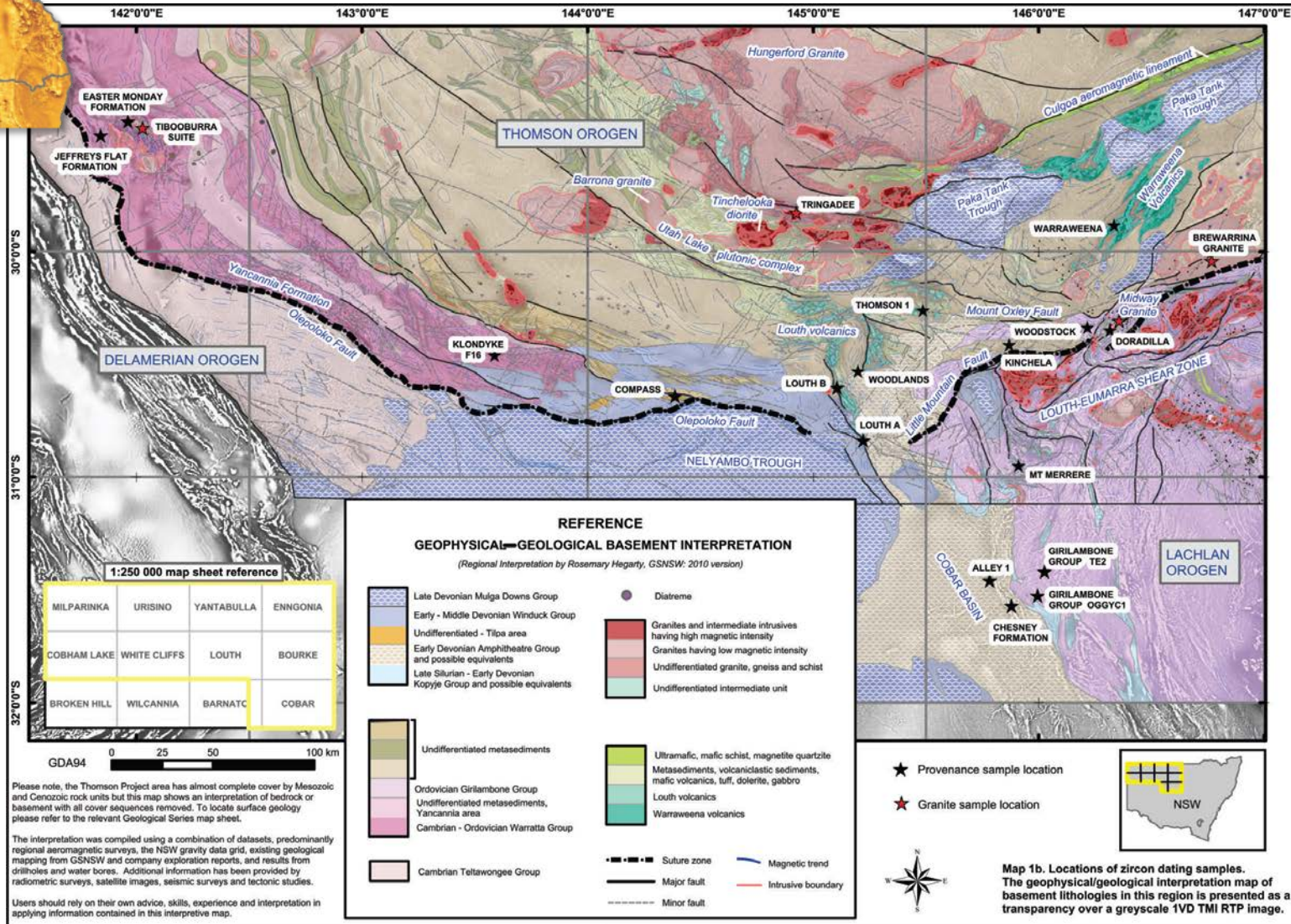


Currawinya Granite



Photos from R.Bultitude

What we know geologically - GSNSW



Thargomindah 1

What we know geologically – Basement drill holes

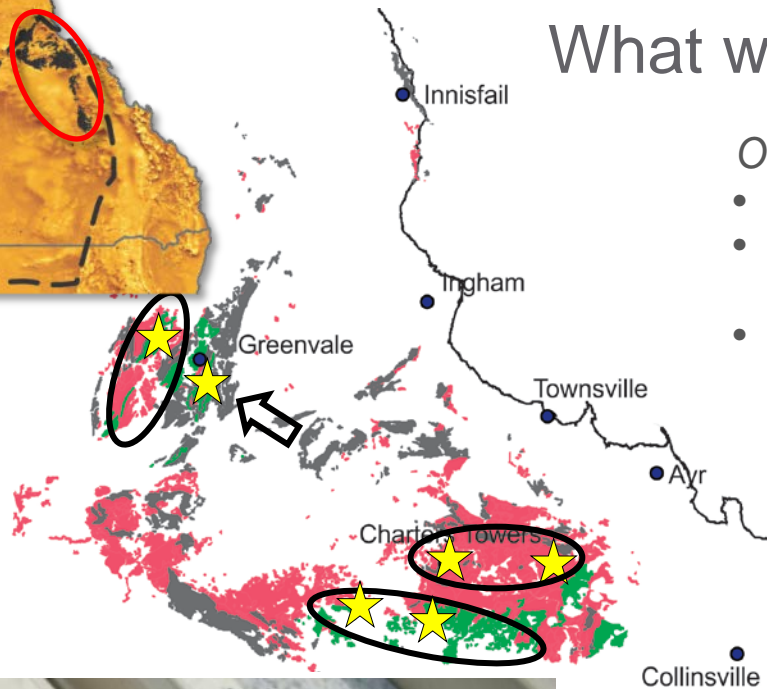


Maneroo 1 - Rhyolite 472.9 \pm 2.7Ma

Coreena 1 - Rhyolite 477.8 \pm 2.6Ma

Thomson (basement)

Eromanga Basin



What we know about mineralisation

Orogenic Gold

- Significantly younger than host intrusive units
- e.g. Charters Towers (~417Ma), Ravenswood (330-310Ma), Clermont, Tibooburra (NSW) (~440Ma)
- Reworked into basal deposits of overlying basins

VHMS

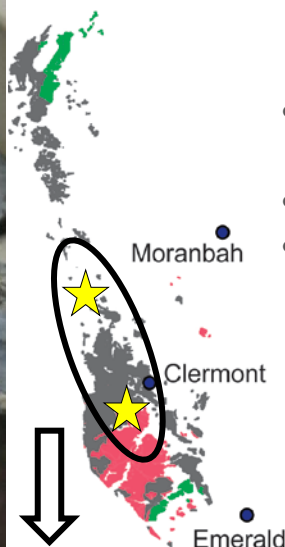
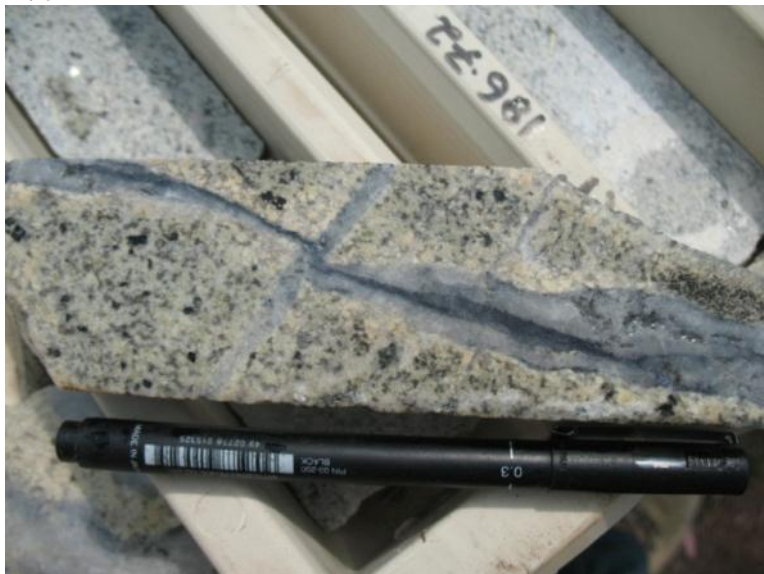
- Exclusively hosted in Camb-Ord sequences
- Associated with small, rhy-dac volcanic centres in below-storm-wave-base conditions
- e.g. Thalanga, Balcooma, Highway-Reward

Porphyry Cu and Mo

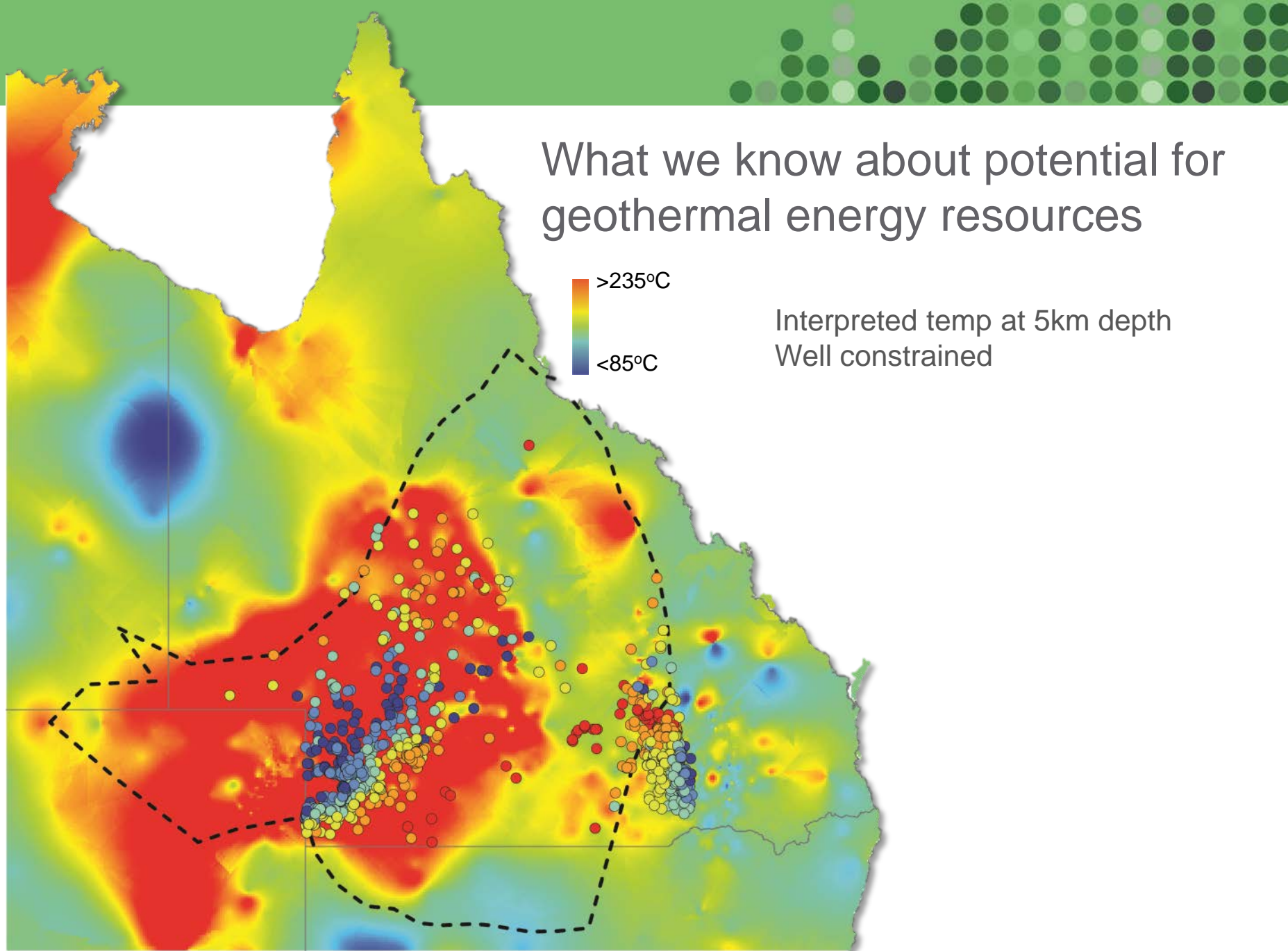
- Associated with small multi-phase intrusions of uncertain age
- Poor exposure
- e.g. Anthony Mo, Rosevale Porphyry Corridor

Other

- Lateritic Ni (Greenvale) – associated with Neopro-Camb



What we know about potential for geothermal energy resources



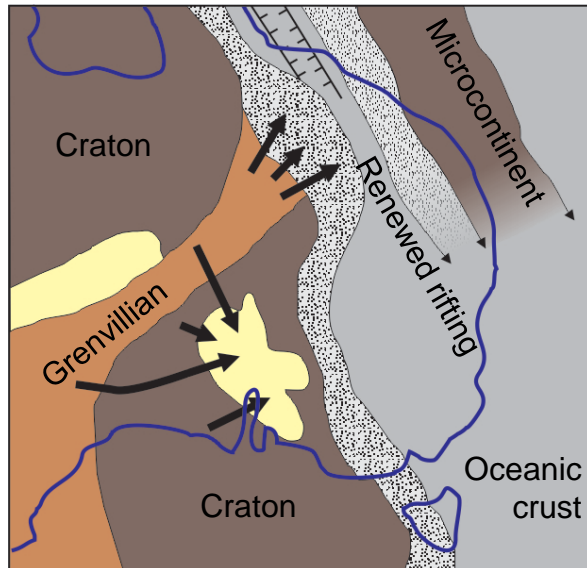


What people speculate on - Tectonics

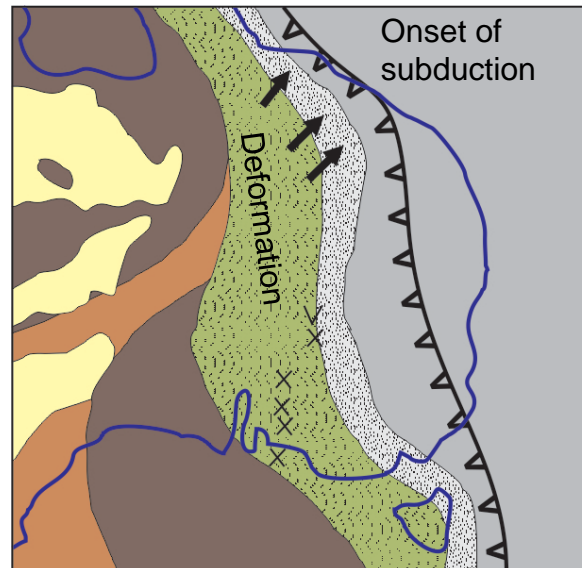
- Models primarily based on South-eastern Australia
- Models focusing on Thomson/Qld are from a small authorship group – few alternative hypotheses...

Tectonic Model

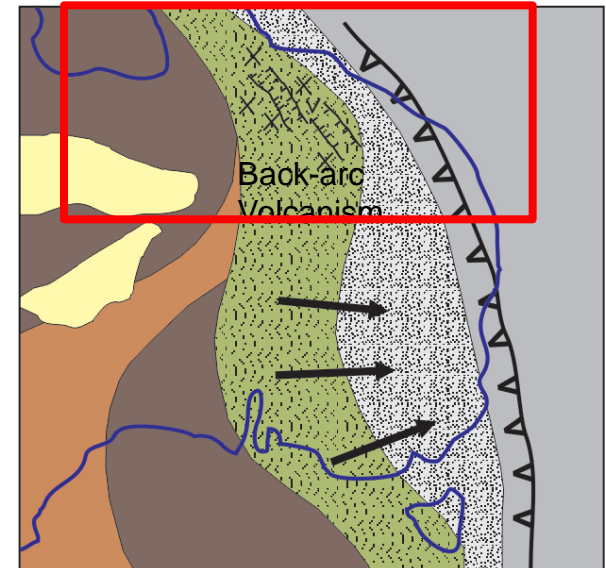
Late Neoproterozoic



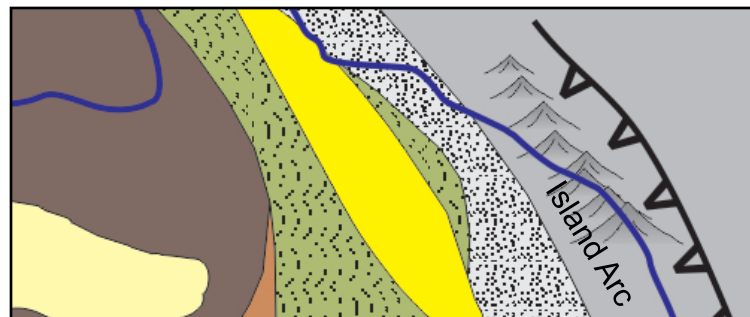
Mid-Late Cambrian



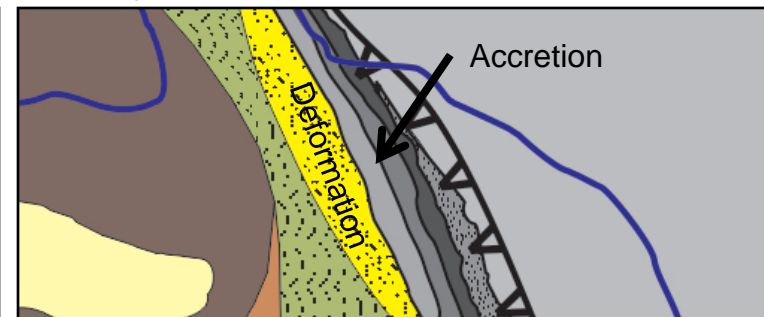
Early-Mid Ordovician



Late Ordovician



Early Silurian



- Oceanic crust
- Craton
- Late Mesoproterozoic belt
- Interior sedimentary basins
- Continental margin basins
- Delamerian orogenic belt
- Back-arc basin deposits

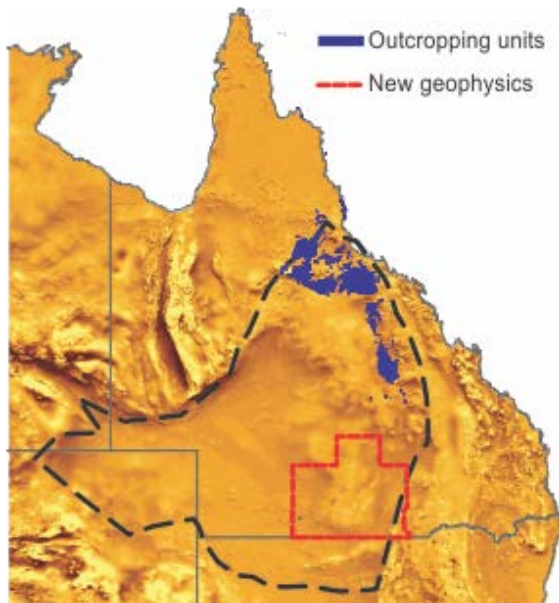
What we are curious about and what is our approach

- This is the interesting aspect of the Thomson Orogen
- Many questions



What we are curious about? - Geology

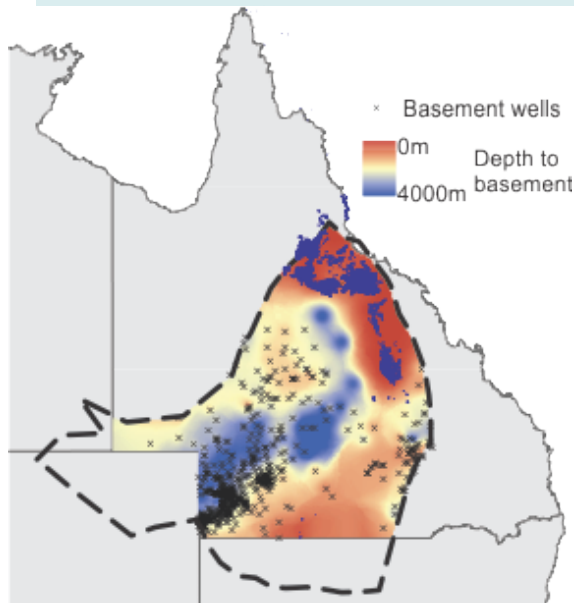
- How much of the undercover area can be correlated with the exposed sequences? Or unexposed sequences such as the Warburton Basin?
- Can subsurface deposits be correlated with the Lachlan Orogen?
- Do provinces of different age or affinity exist? e.g. Mesoproterozoic (Grenvillian)??
- What is the distribution, age and setting of intrusive rocks?, can new batholiths be defined?



- Characterise outcropping Thomson Orogen geology – compilation of existing geochronology, metamorphic/deformation history
- Construct database of basement material from petroleum drill holes – lithology, petrographic characteristics, age, geochemistry -> new data
- Geochronology program, detrital and magmatic
- Complete basement interpretation map using existing and new geophysics – due for release early 2012

What we are curious about? – Economic Potential

- Outcropping are is relatively small but rich in mineralisation
- What mineralisation styles might be expected in the subsurface?
- Can we constrain the potential distrubition of mineralisation? (e.g. VHMS exclusively in Cambro-Ord ‘back-arc’ deposits)
- What depths might be expected?
- What is the origin of the temperature anomaly in the south-western Thomson Orogen? Aquifer/basin control? or basement geology/deeper crust control?



- Complete review of known mineralisation and current exploration trends
- Provide new geochronology and other detailed investigations of new/poorly constrained deposits
- Generate a depth to basement (depth to Thomson Orogen) surface
- Characterise the intrusive rocks in covered areas (from drill holes) – collaborative work with Coralie Siegel, QUT



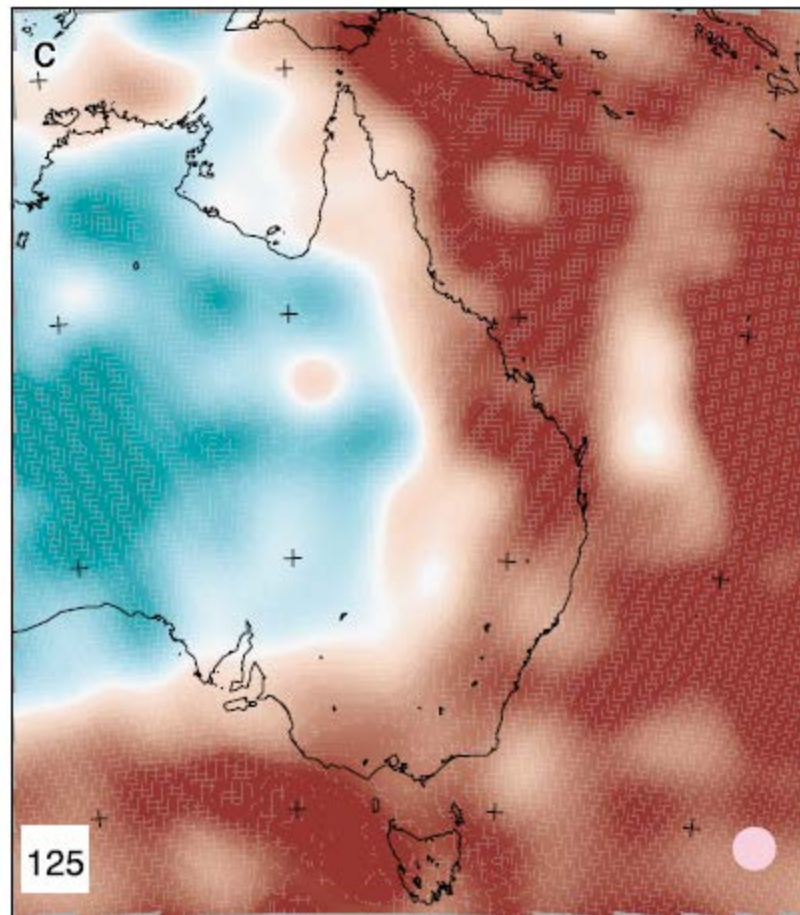
What we are curious about? – Tectonic development

- Potential problem with current models - based on a very small % of total Thomson Orogen area and a relatively short time interval
 - When did magmatism, deformation, metamorphism and uplift occur? and how does this compare to adjacent terranes?
 - What is the source of sediments in the covered area?
 - Are there any rocks that record initial break up of Rodinia or any of the period between this and deposition of the Anakie rocks?
 - What is the age, nature, and distribution of crust that underlies the Thomson Orogen?
-
- Add new constraints and detail through...
 - Investigations and mapping of the undercover geology
 - Compilation of thermal history for a suite of outcropping and undercover Thomson Orogen rocks using U/Pb (zircon) and lower temperature methods
 - Compilation of detailed time-space relationships for magmatism, deformation, and metamorphism – compare/contrast with adjacent tectonic elements

Questions...



Spare



Kennett et al, 2004

