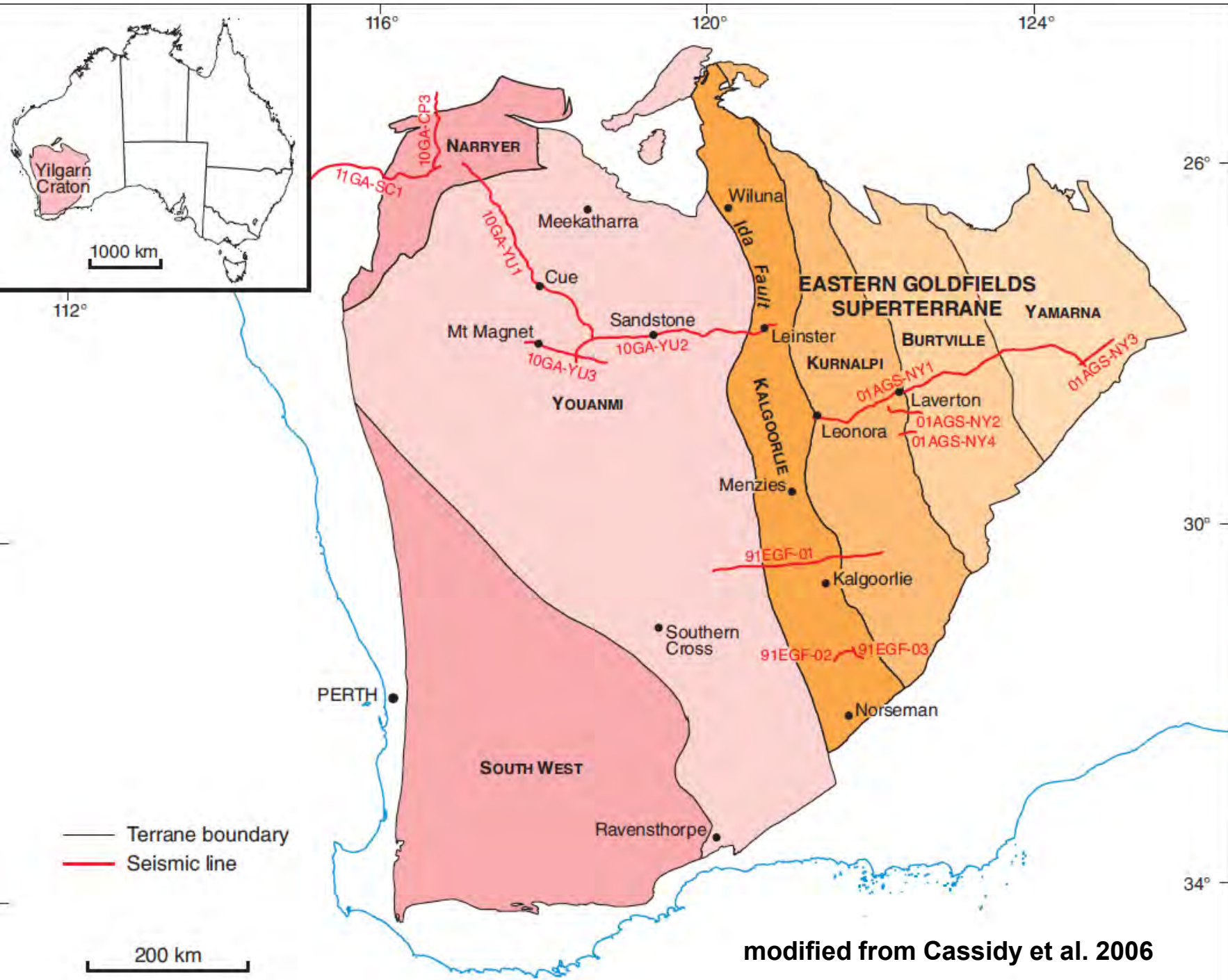


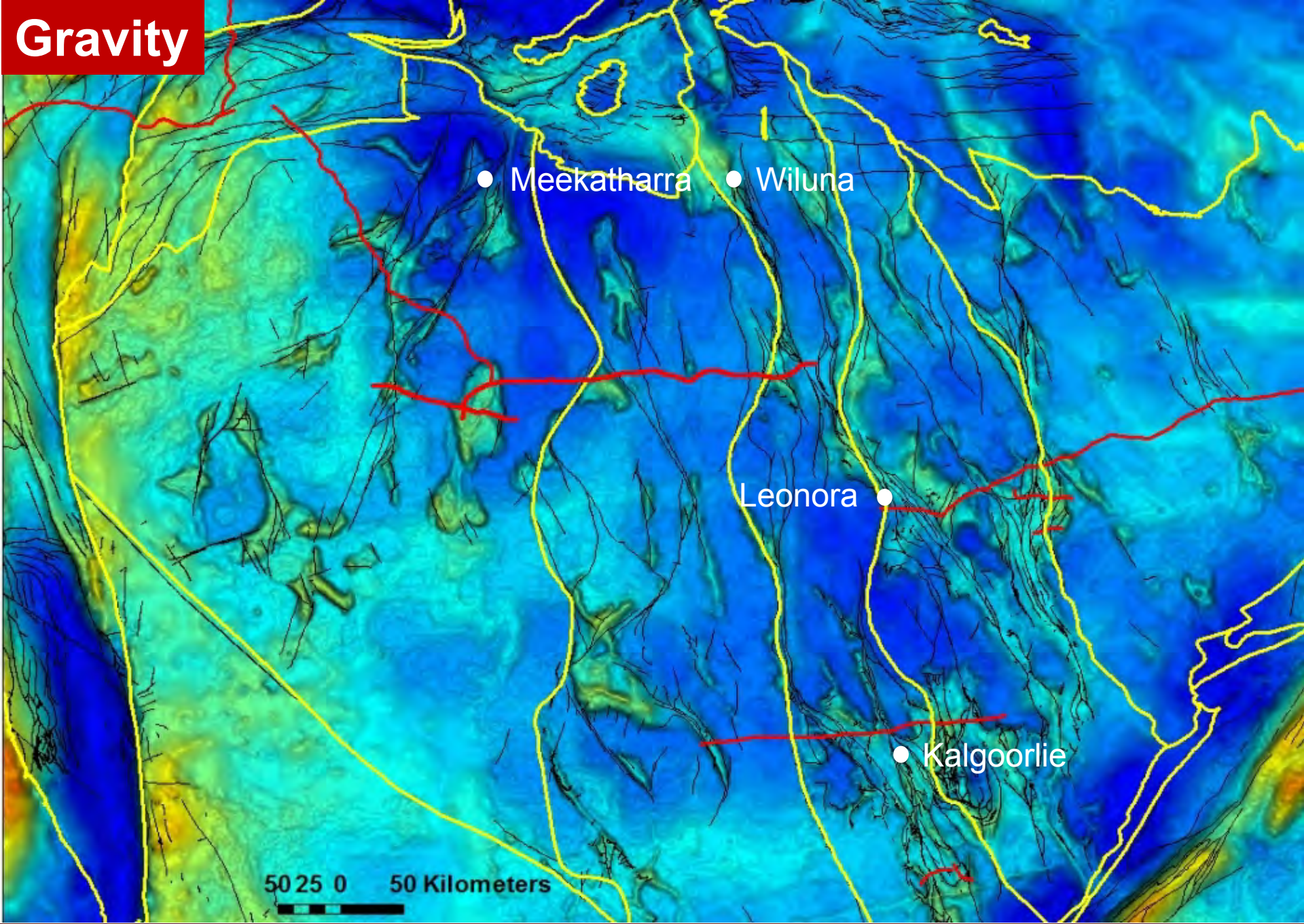
# Yilgarn overview

Stephen Wyche, Mark Pawley, Shefa Chen, Tim Ivanic, Ivan Zibra, Martin Van Kranendonk, Catherine Spaggiari and Mike Wingate

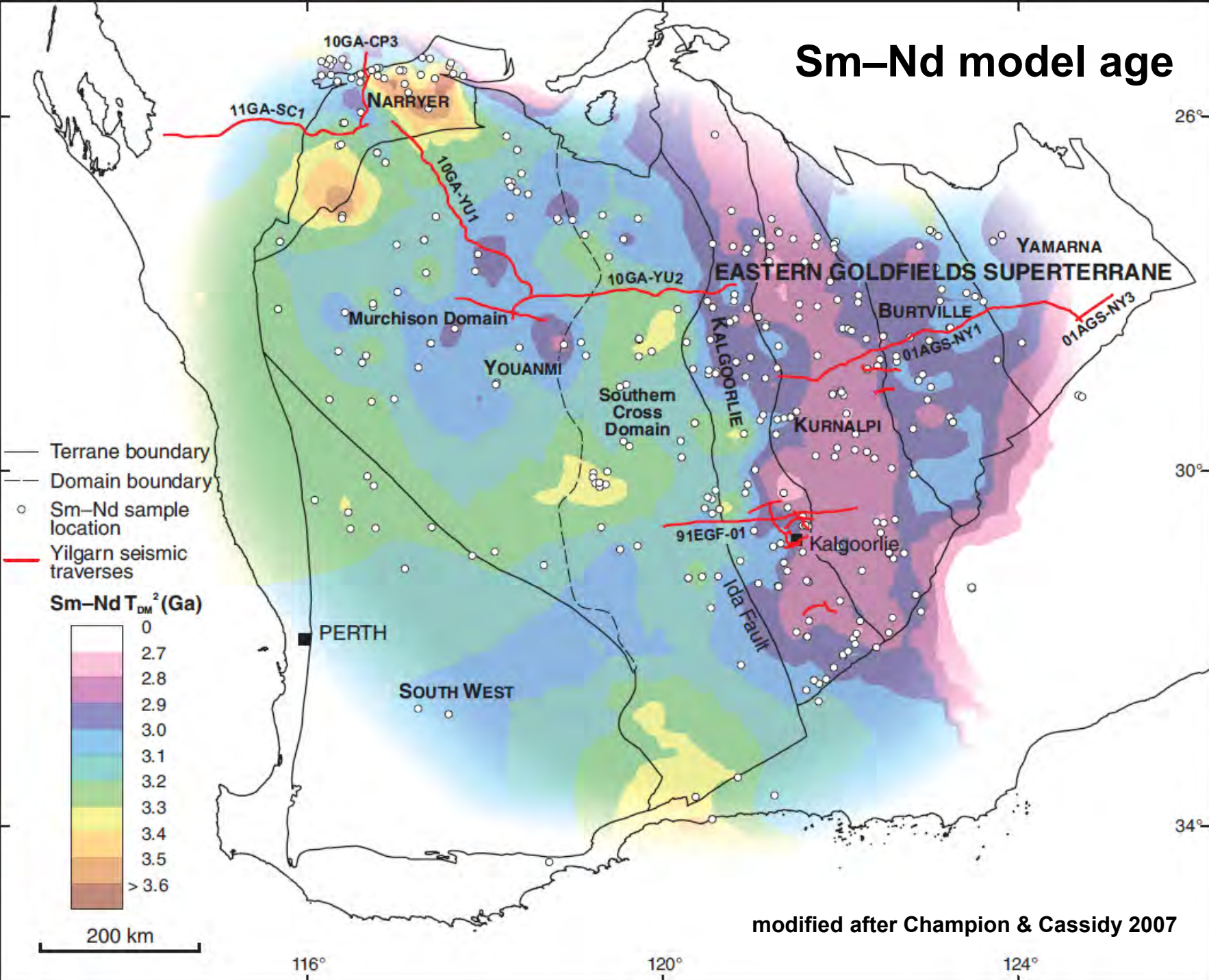


modified from Cassidy et al. 2006

# Gravity



# Sm–Nd model age

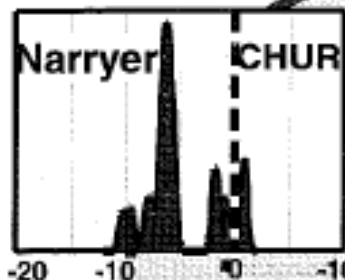
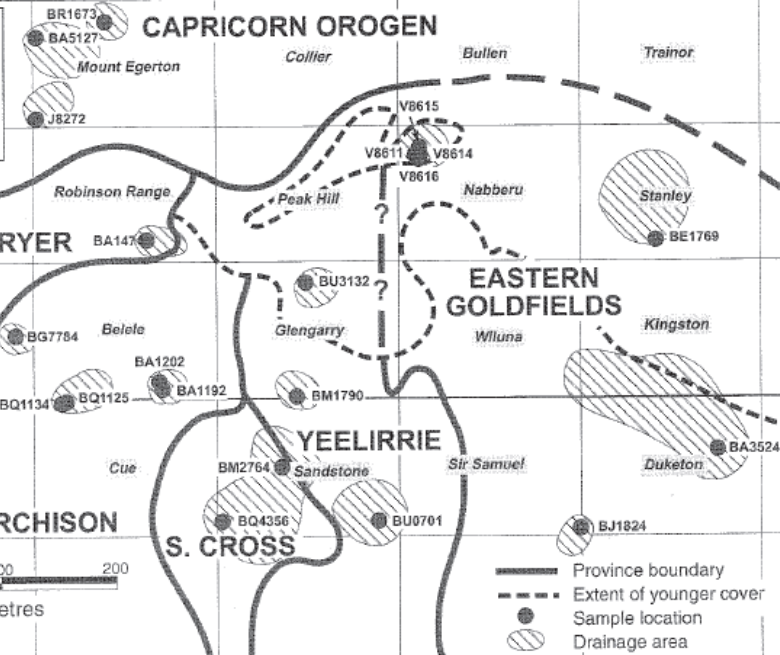
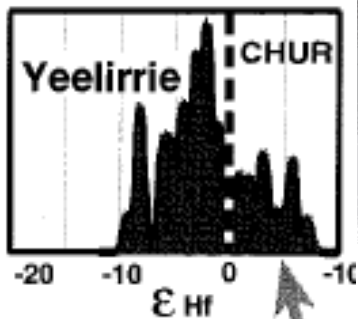


# Lu–Hf isotopes



Primary use of Lu–Hf isotopic data on dated crystals is to distinguish grains formed in juvenile magmas from those generated during the melting of older continental crust or affected by substantial crustal contamination.

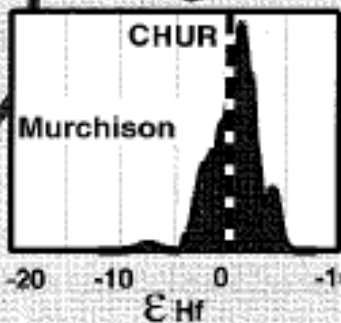
# Regional Lu-Hf



NARRYER

MURCHISON

● Meekatharra

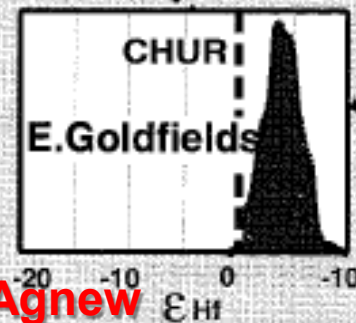


Murchison

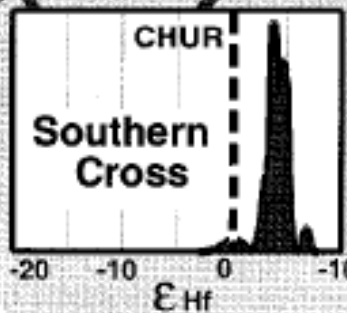
YEELIRRIE

S. CROSS

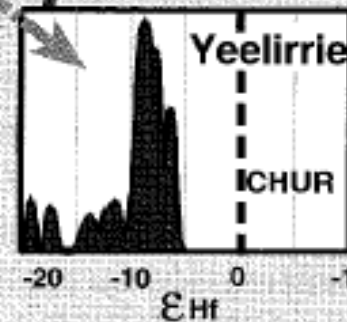
● Agnew



CHUR  
E. Goldfields



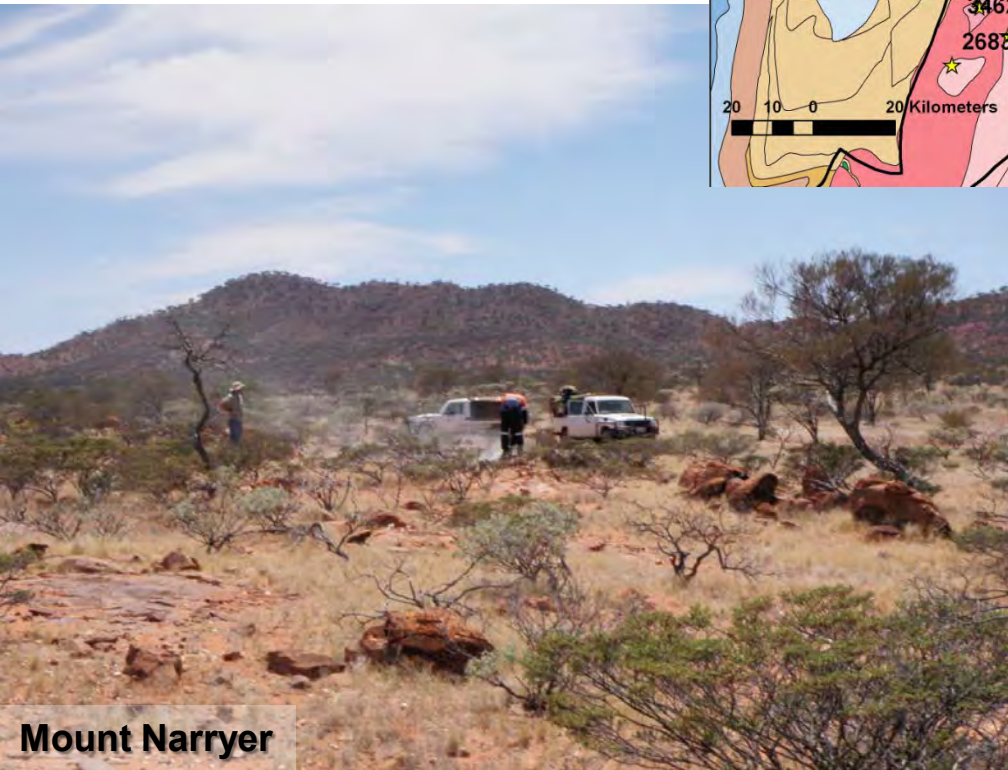
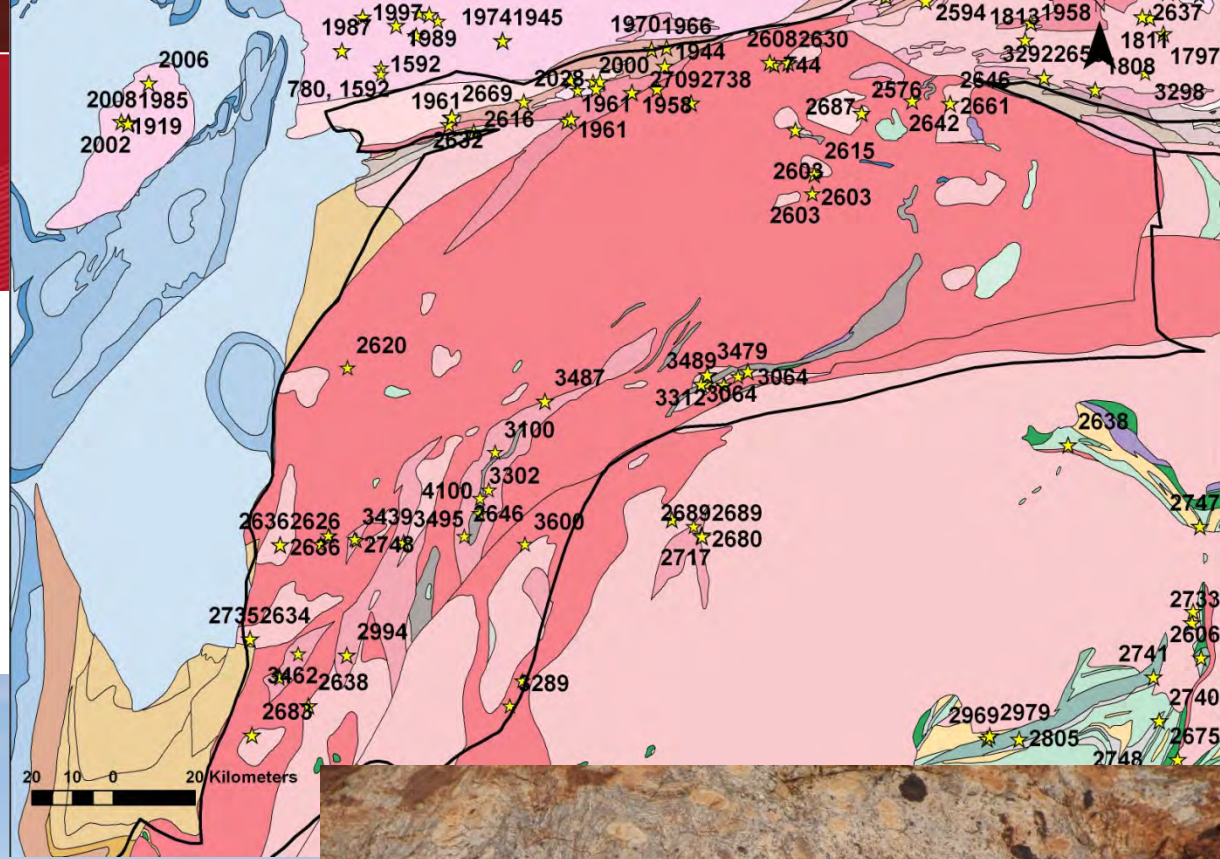
Southern Cross



Yeelirrie

# Narryer

- Granite, gneiss, anorthosite, gabbro, ultramafics back to 3730 Ma; high-grade metamorphism
- Jack Hills, Mt Narryer >4 Ga detritals



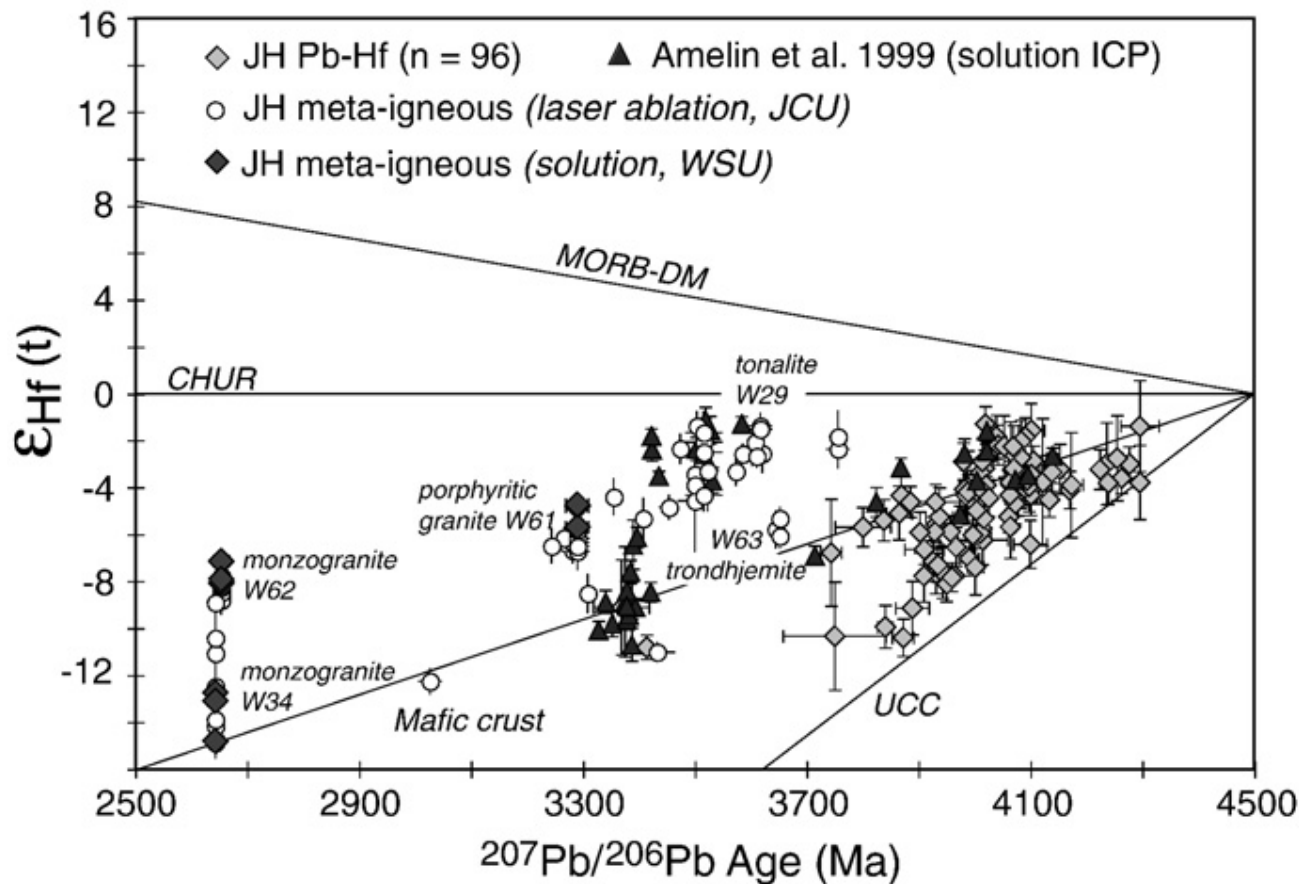
Mount Narryer

Meeberrie Gneiss

# Narryer Lu–Hf



Very old crust with strong reworking

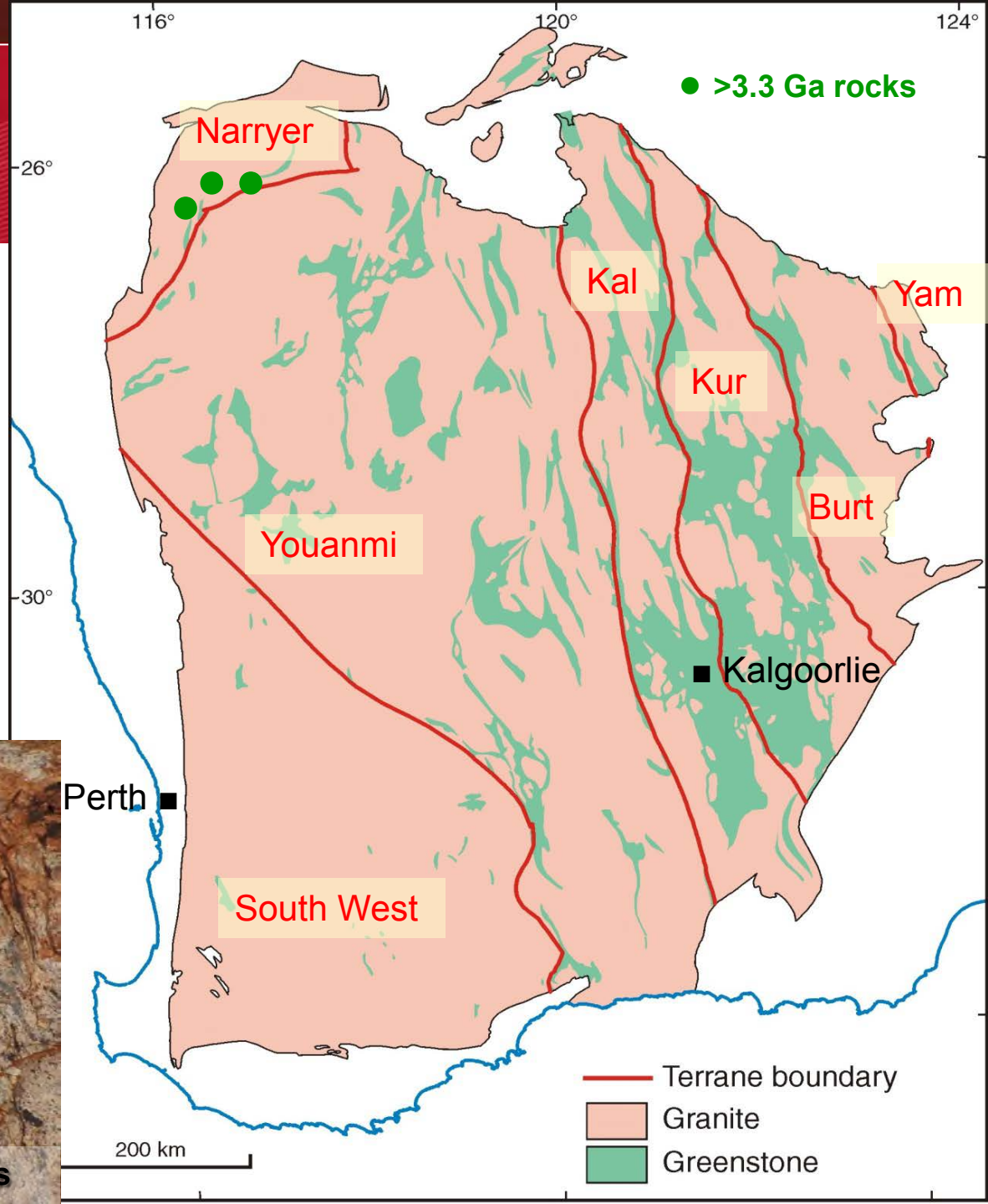


Kemp et al. 2010



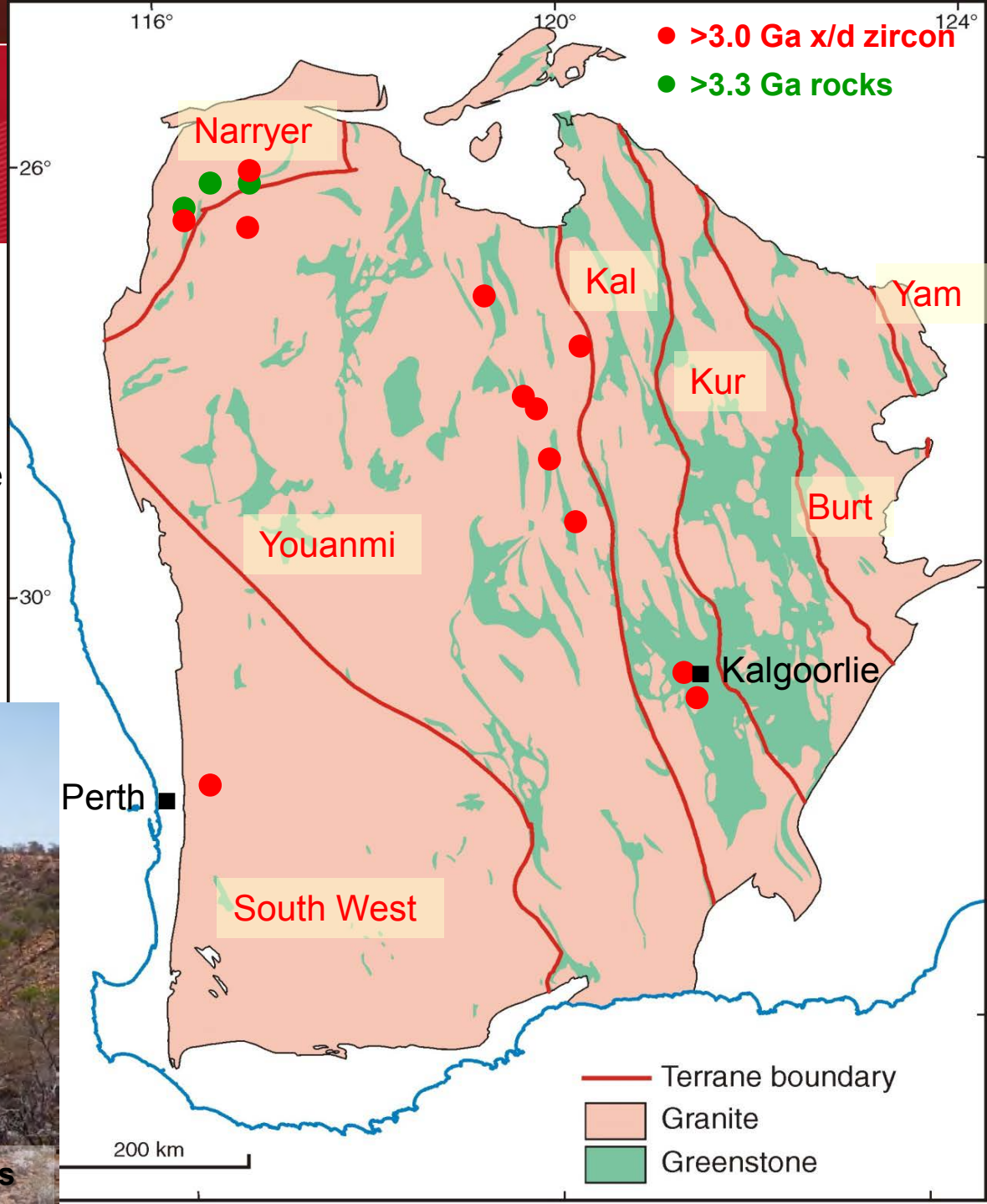
# Oldest rocks

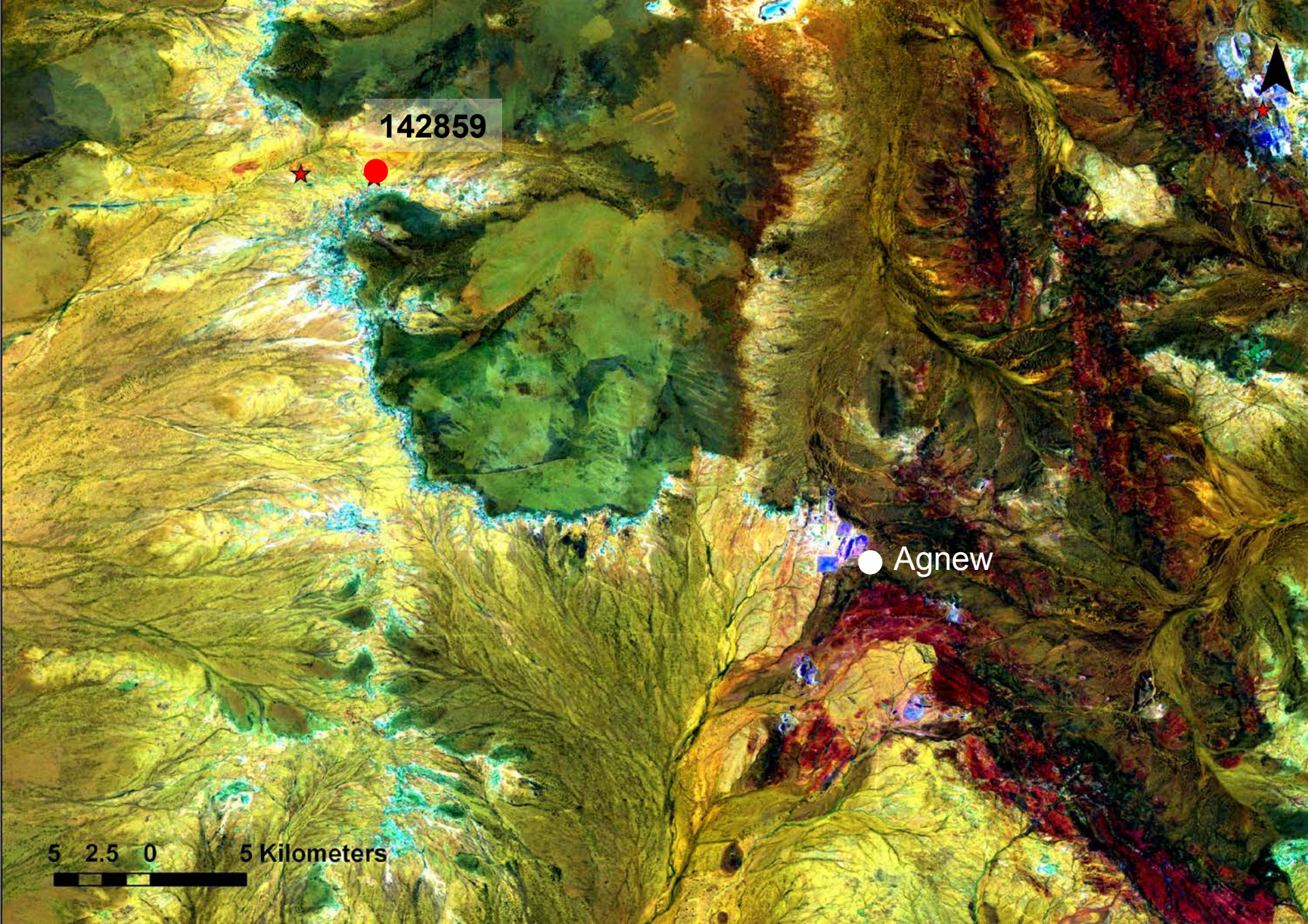
Oldest (granite/gneiss) component (>3.3 Ga) confined to Narryer



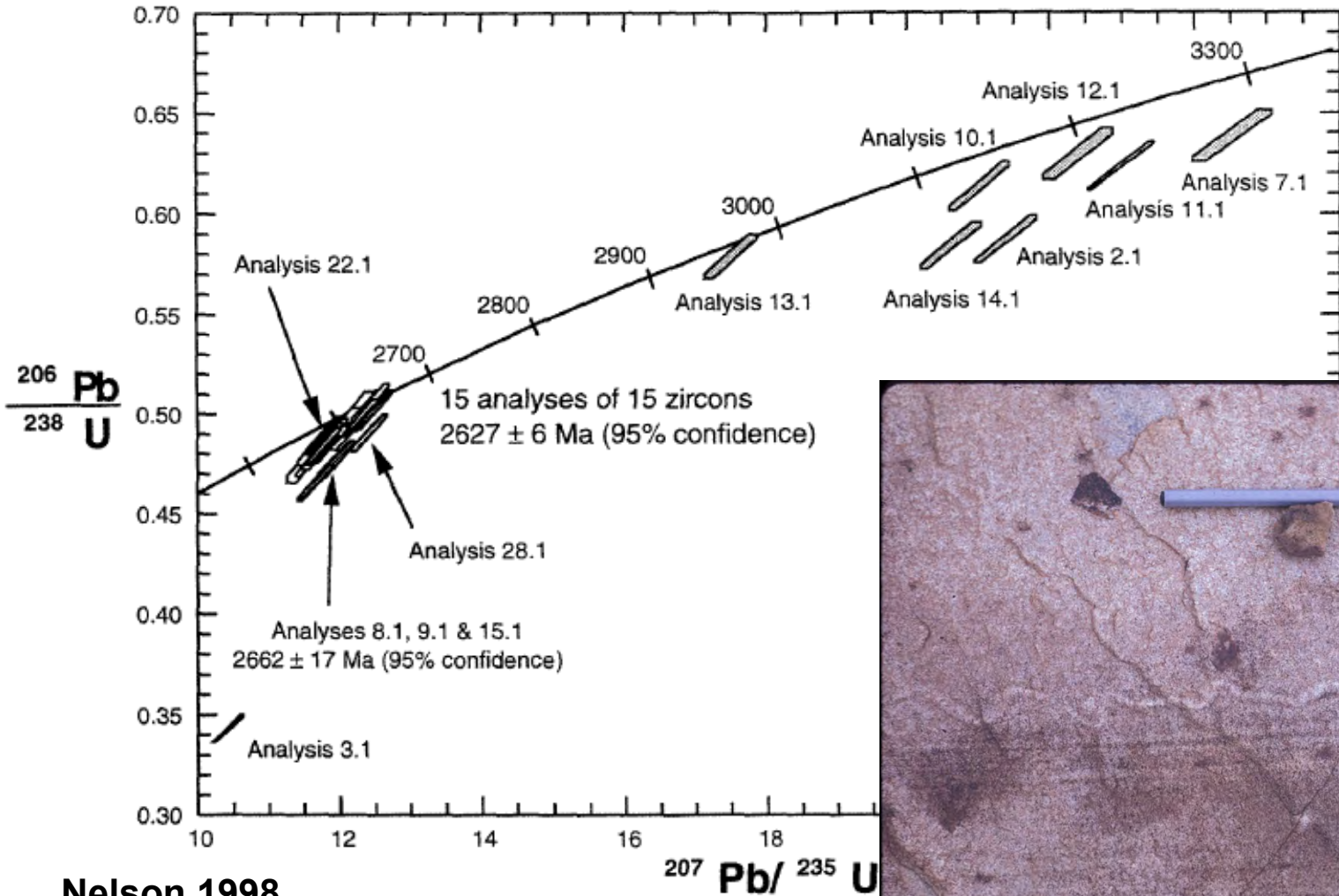
# Old basement?

- >3 Ga xenocrysts/detritals:
  - Locally abundant in Youanmi Terrane
  - Locally abundant in Kalgoorlie Terrane
  - Rare in Kurnalpi Terrane
  - Not yet found in Burtville and Yamarna terranes





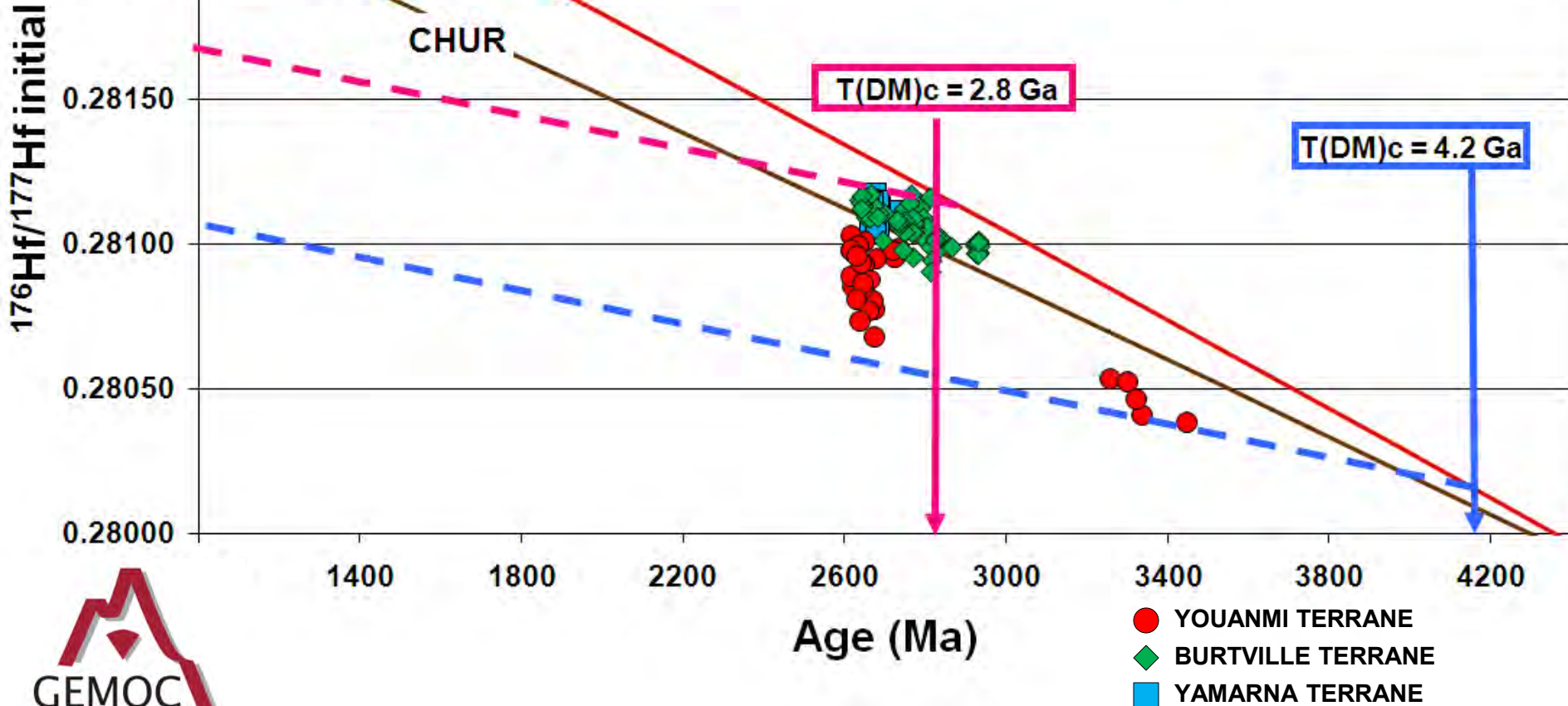
# 142859



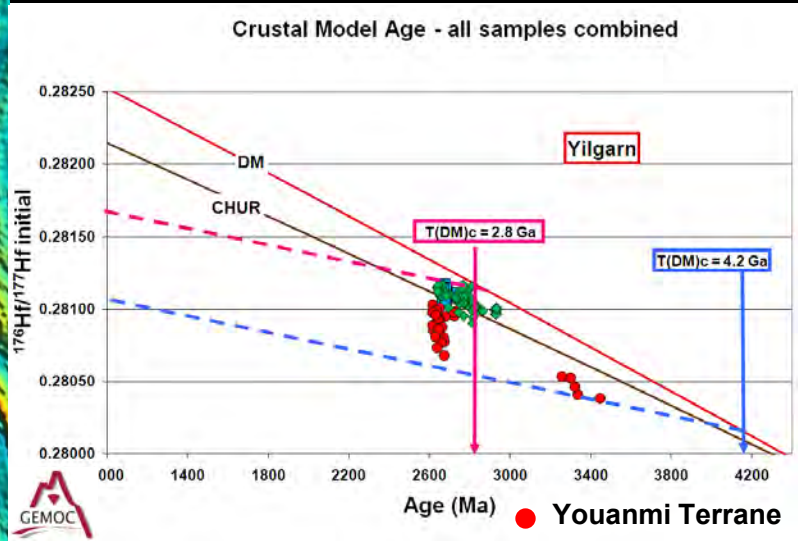
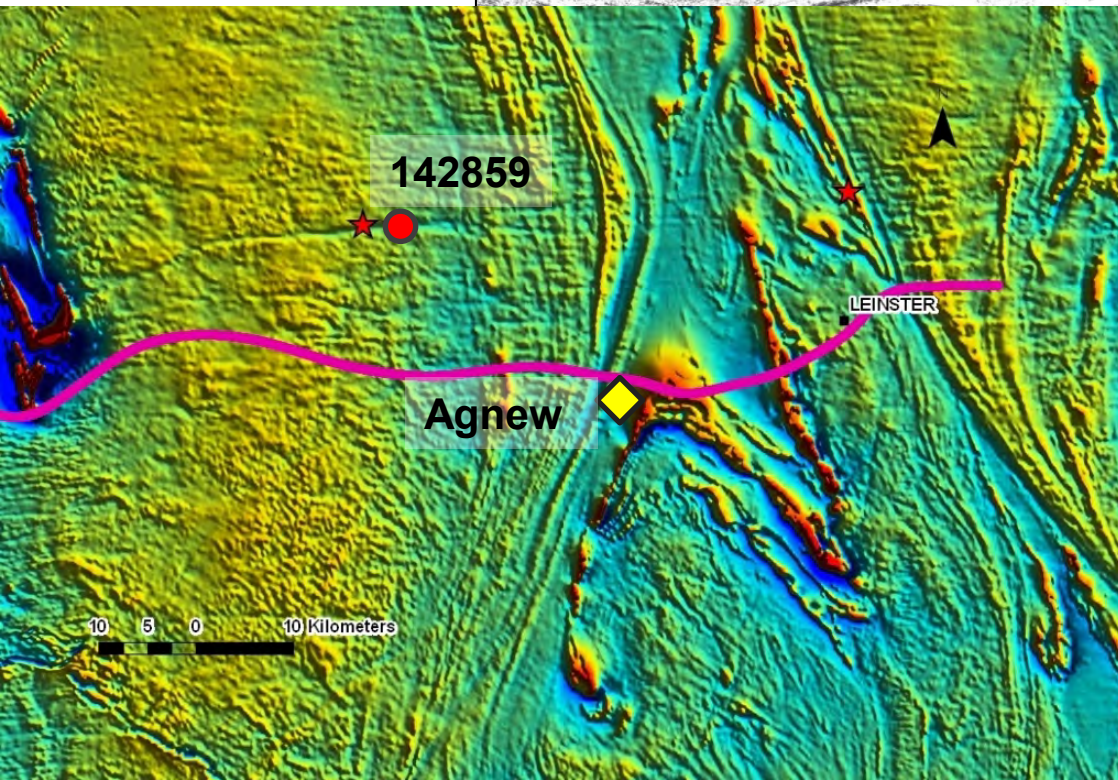
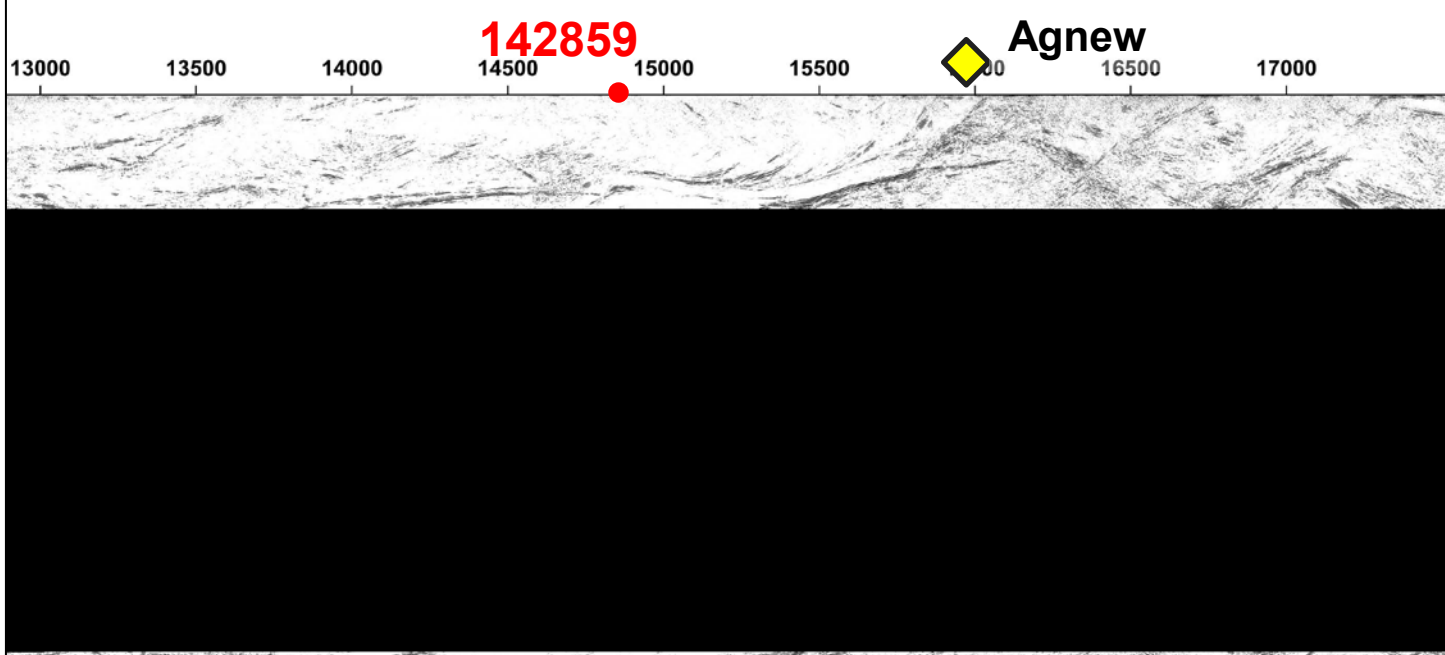
Nelson 1998

# Crustal Model Age - all samples combined

Lu-Hf

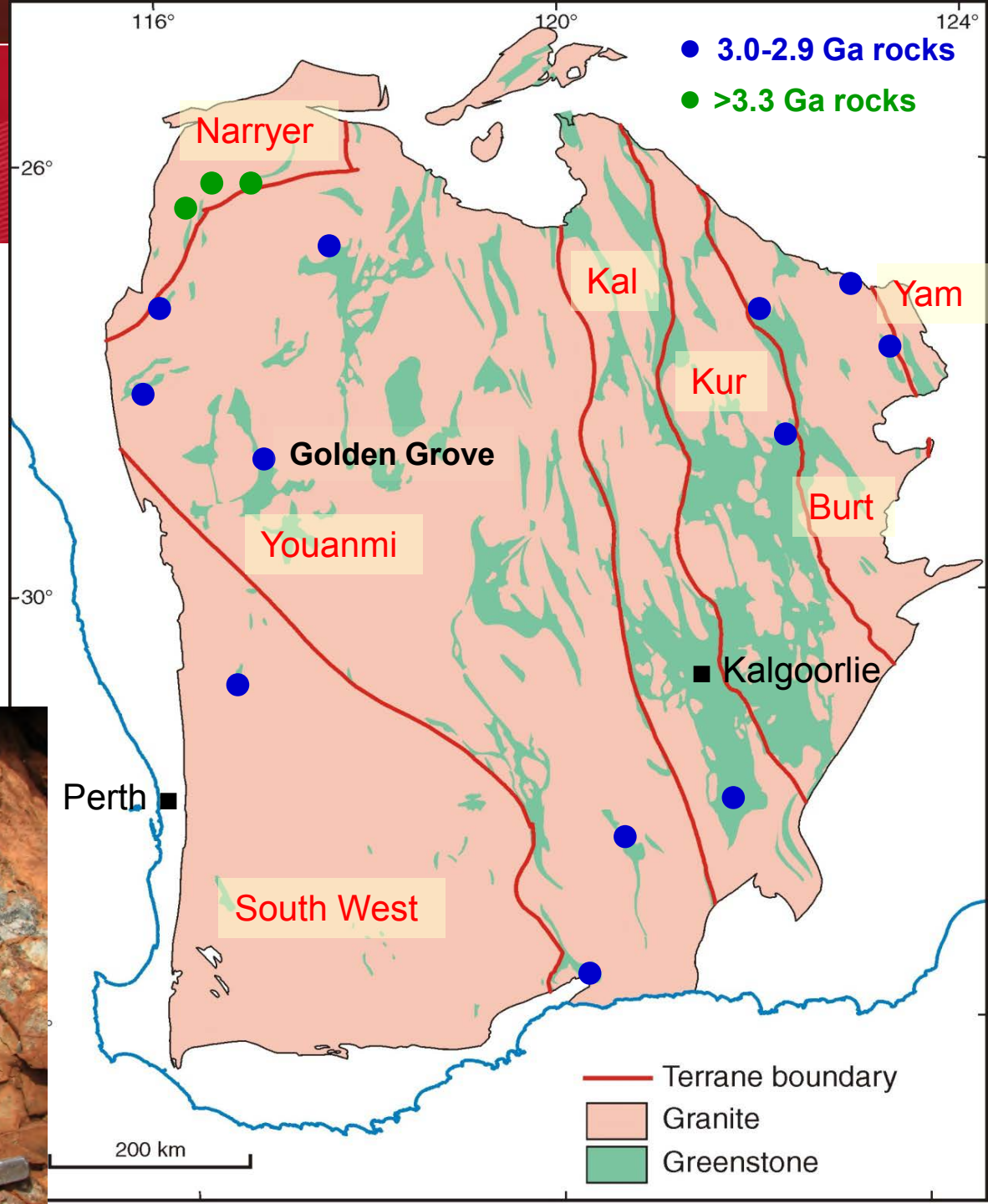
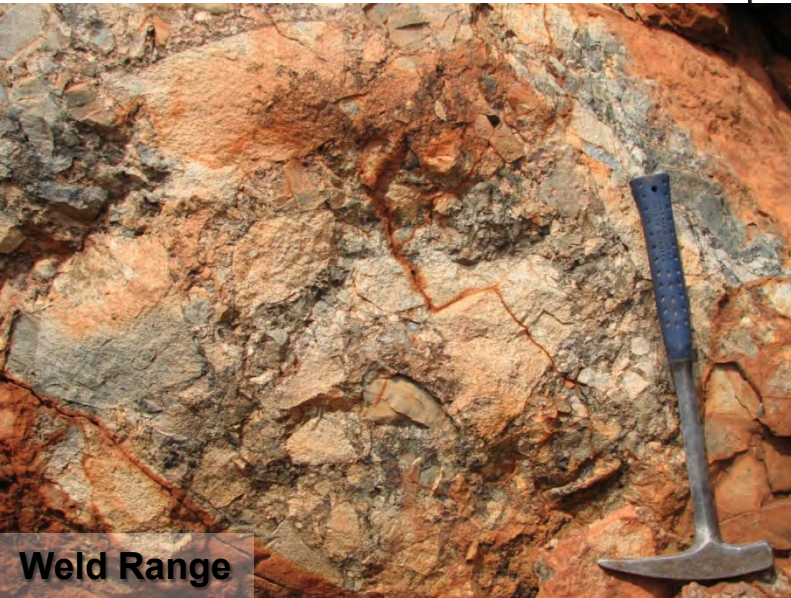


Where do the zircons come from?

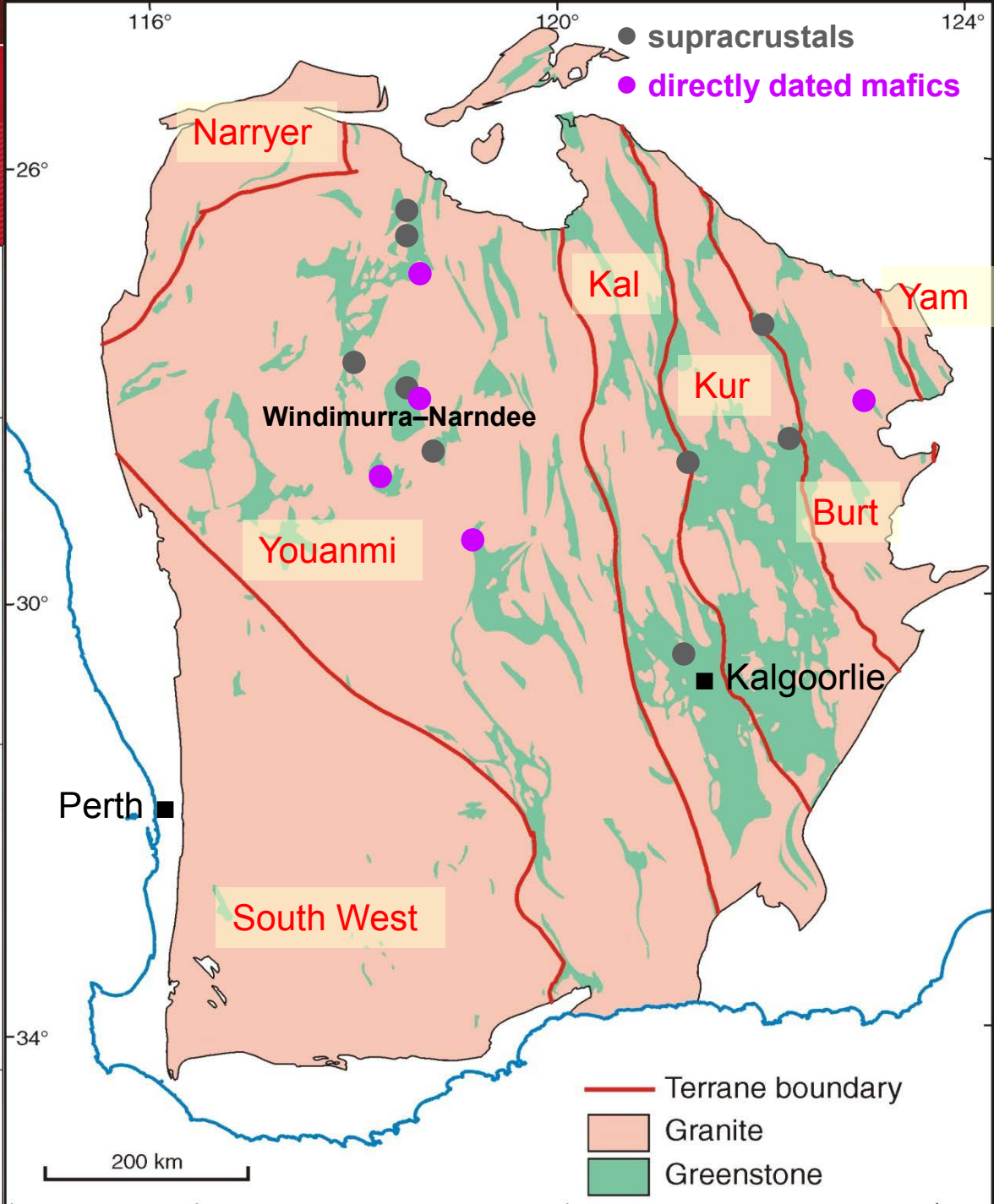
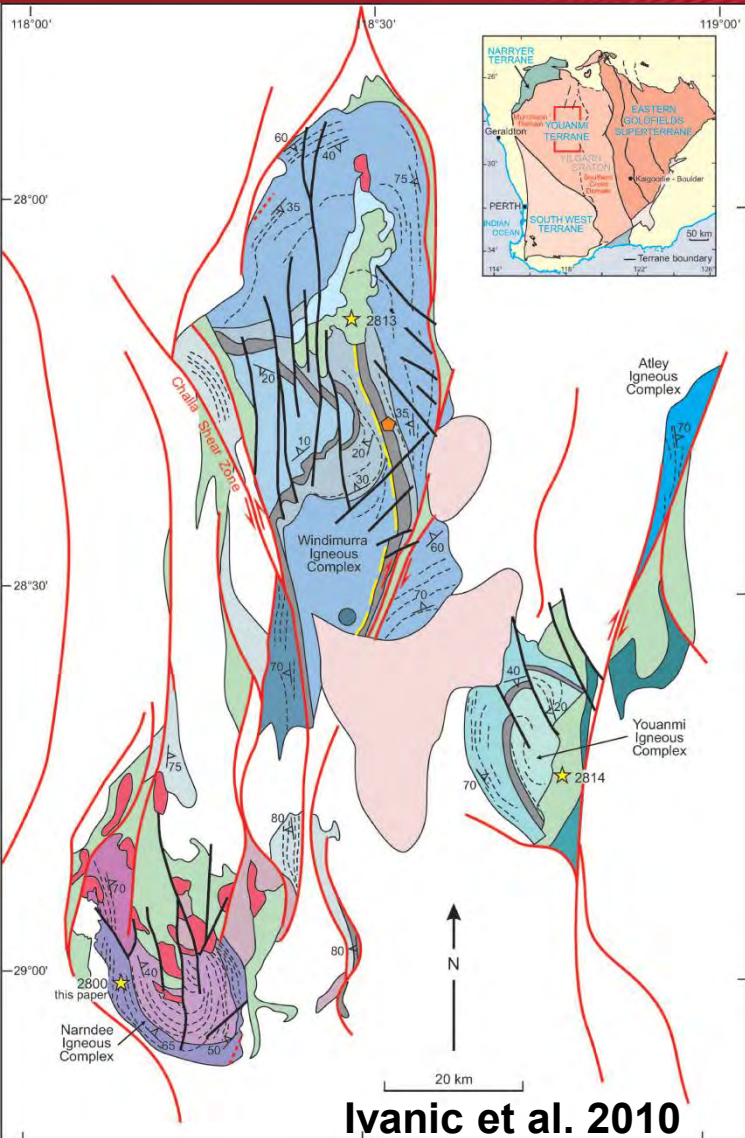


# >2.9 Ga rocks

>2.9 Ga supracrustals and granites



# 2.8 Ga plume







# Murchison

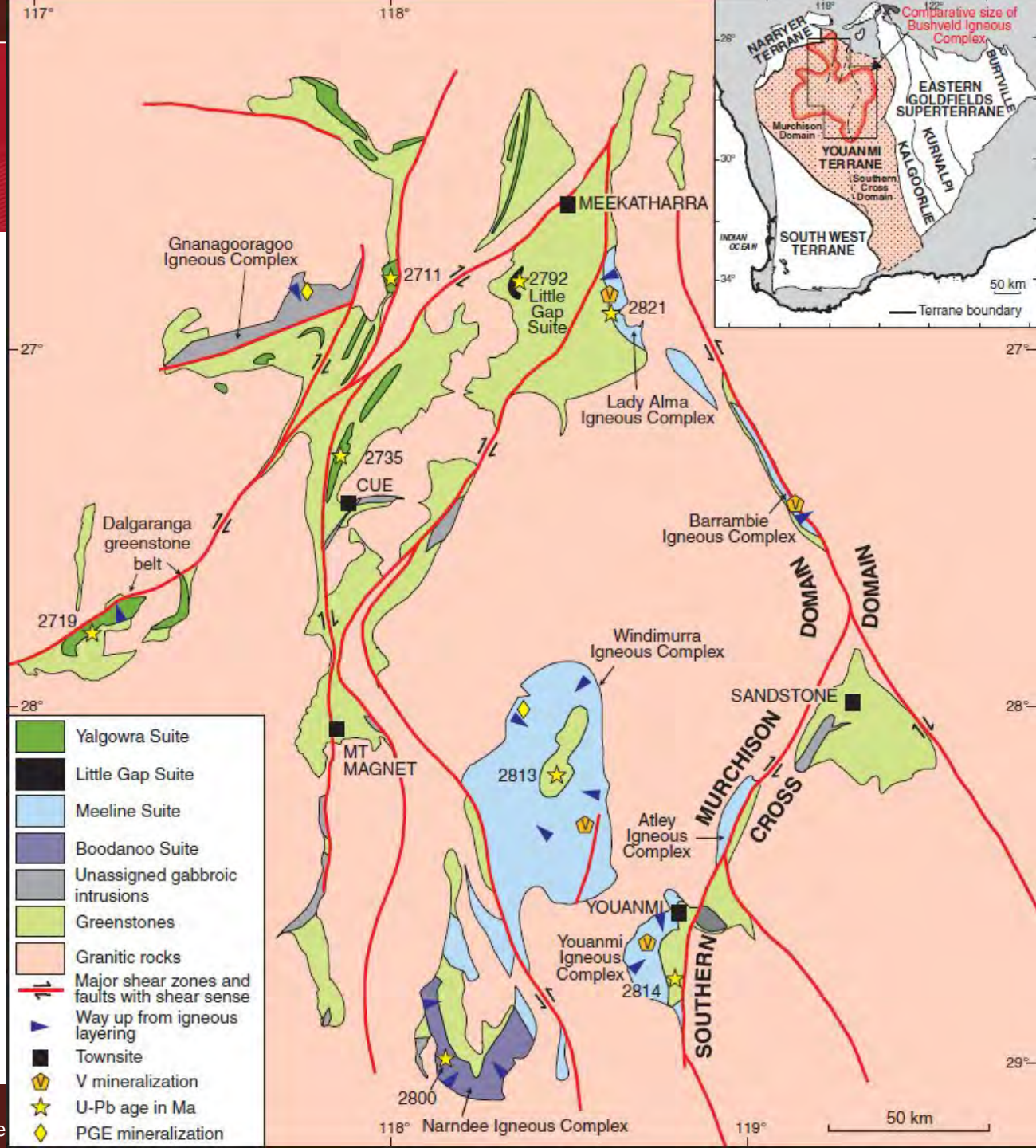
## 2820– 2710 Ma

- Dismembered greenstones
- Large layered mafic-ultramafic igneous complexes and sills

## 2785–2600 Ma

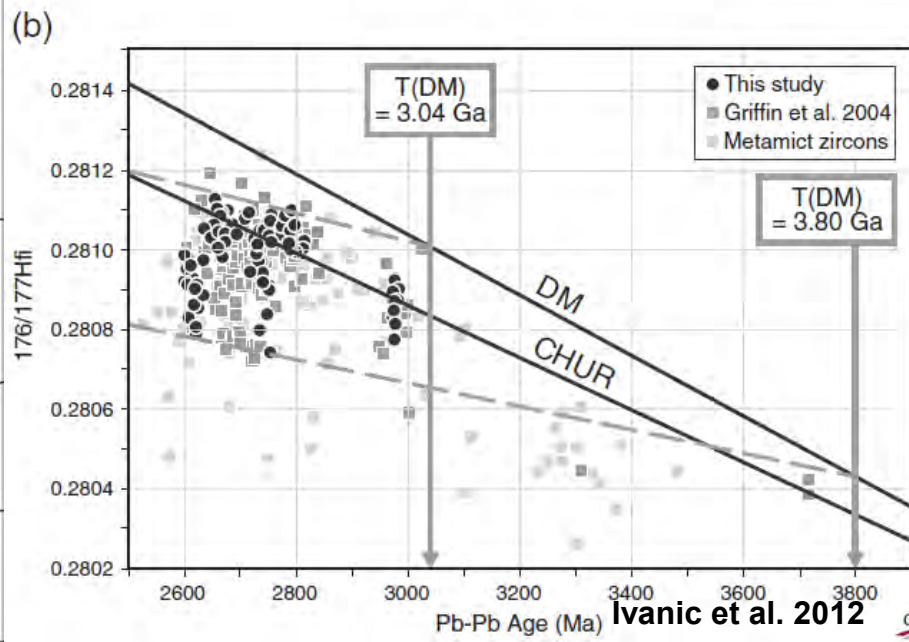
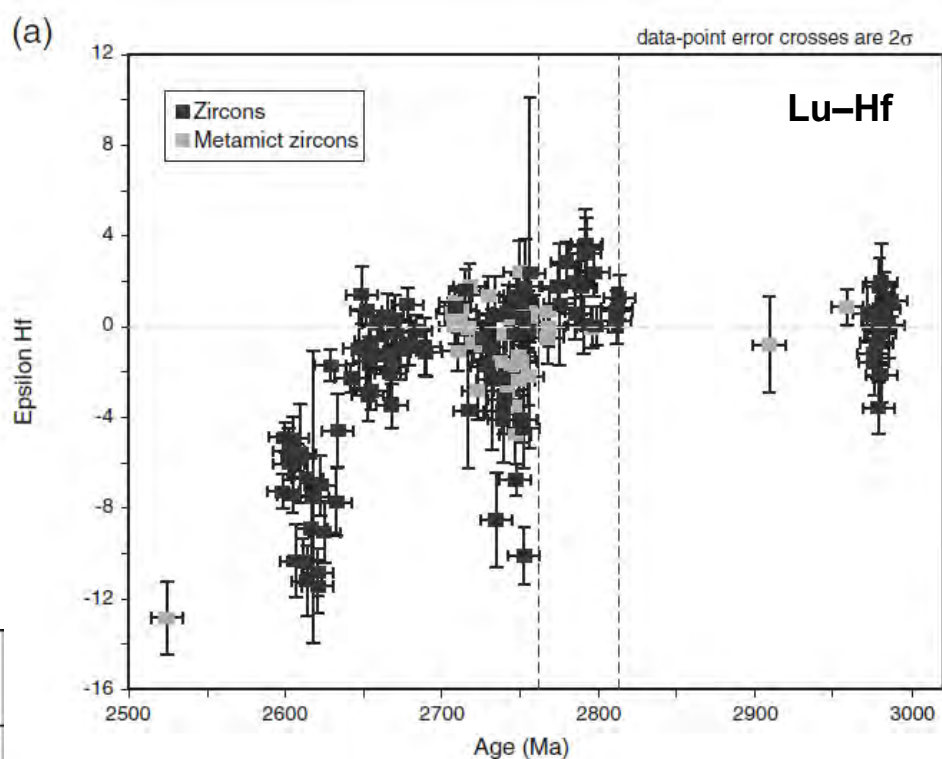
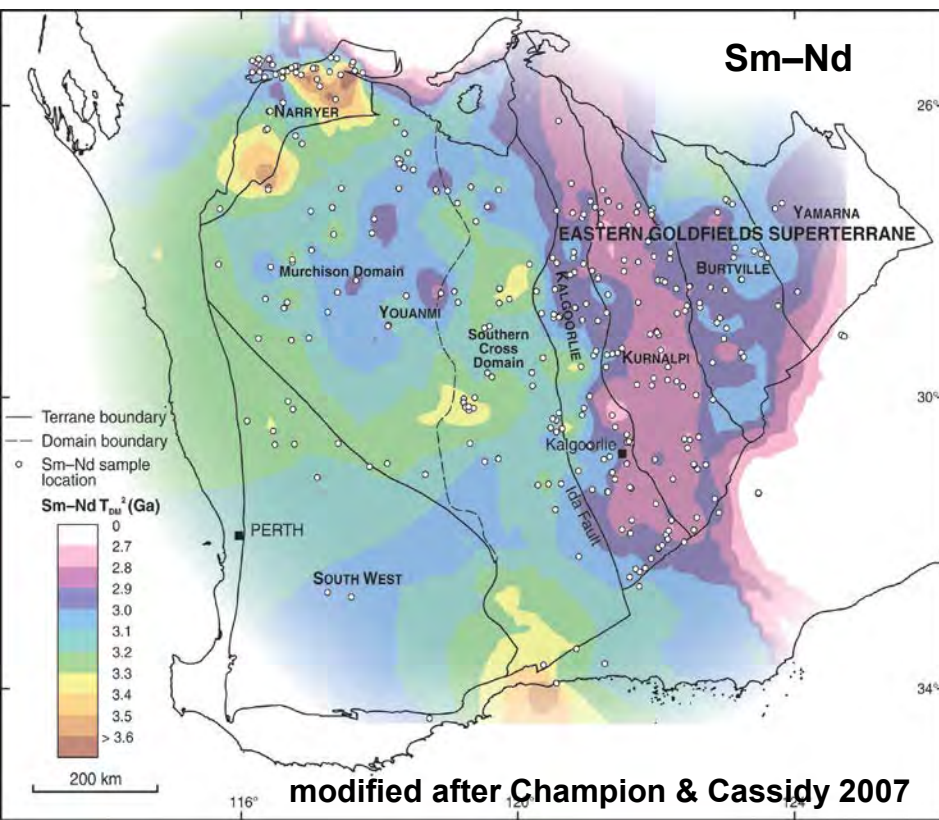
- Evolving granite suites

Ivanic et al. 2010, 2012



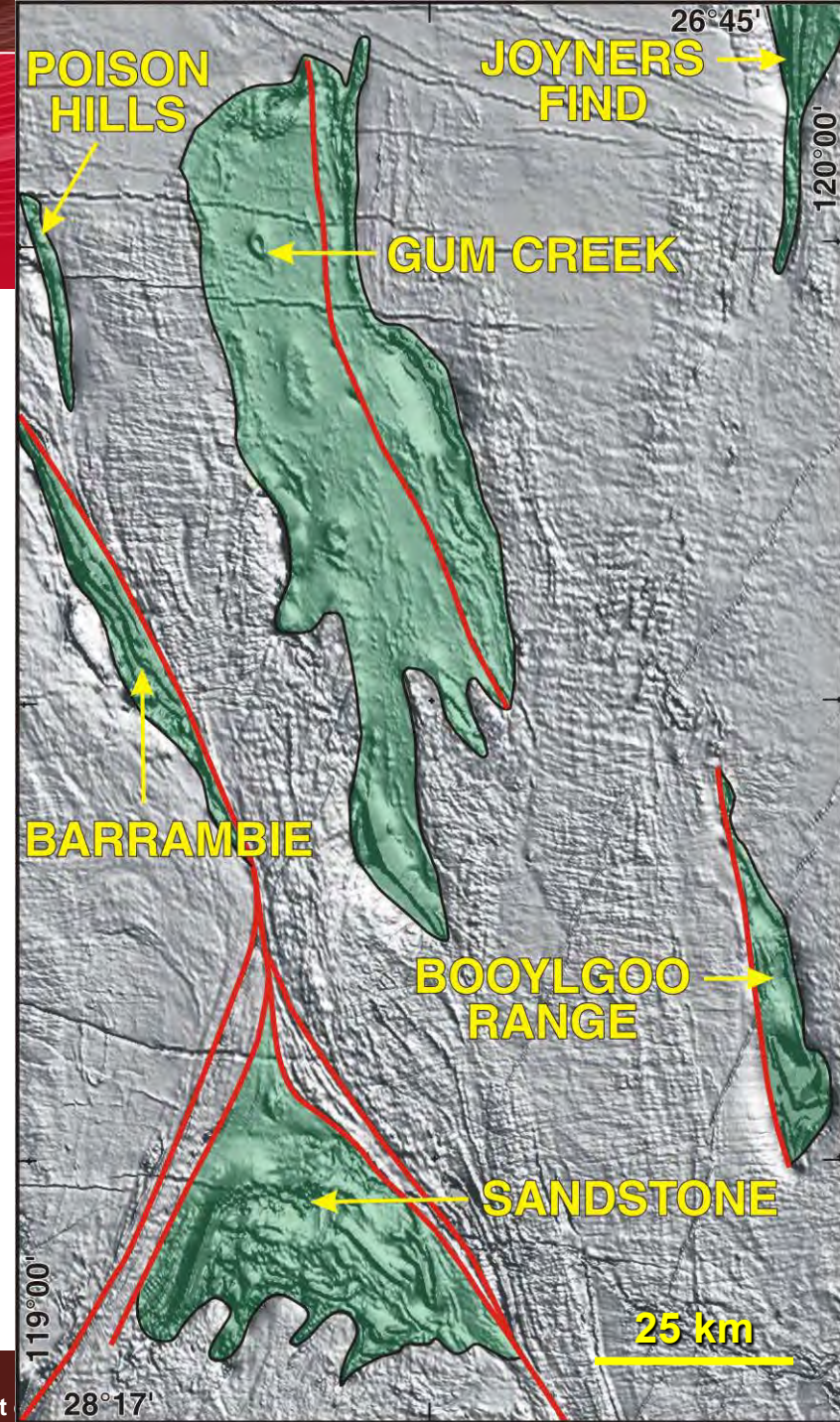
# Murchison

Multiple episodes of recycling



# N Southern Cross stratigraphy

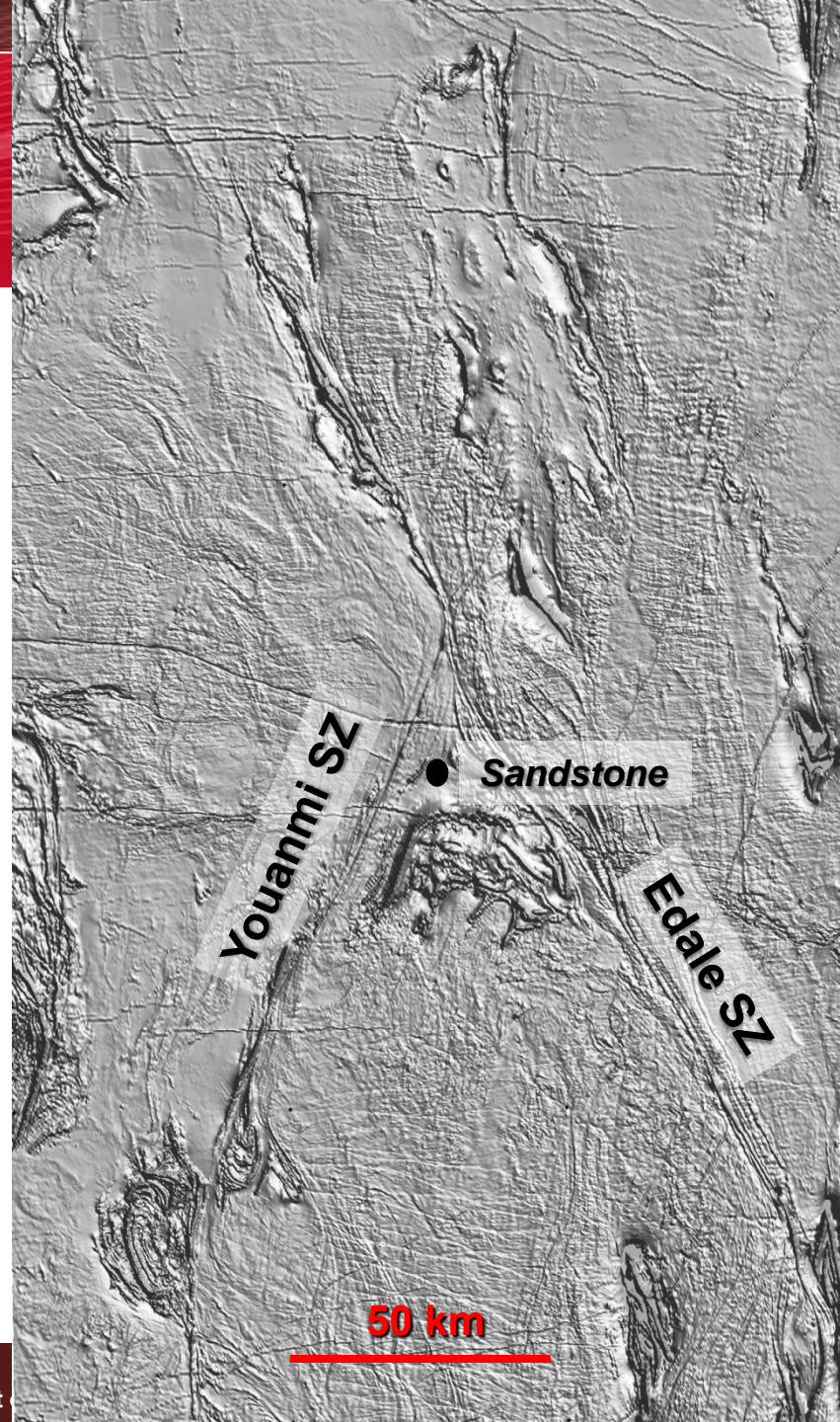
- like Murchison with fewer felsic volcanics
- quartzite low in succession
- mafics dominantly tholeiitic
- ultramafics most abundant in Sandstone belt
- layered mafic–ultramafic bodies in most belts
- felsics rare — typically <2750 Ma
- clastic sediments in upper part



# N Southern Cross structure

- **Late** brittle structures
  - faults and kinks
- E–W shortening
  - regional shear zones
- E–W shortening
  - upright folds and reverse faults
- **Early** ?N–S shortening
  - early recumbent folds and thrusts

Chen et al. 2004



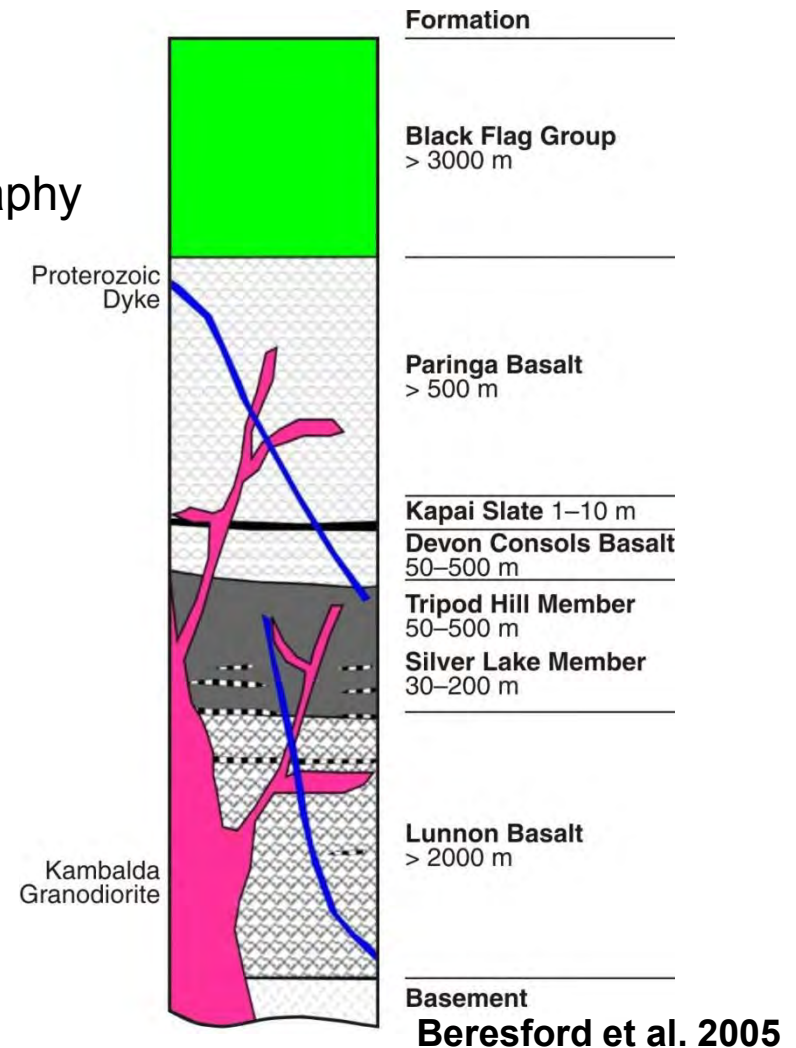
# Kalgoorlie Terrane stratigraphy



Widely recognized Kalgoorlie Terrane stratigraphy

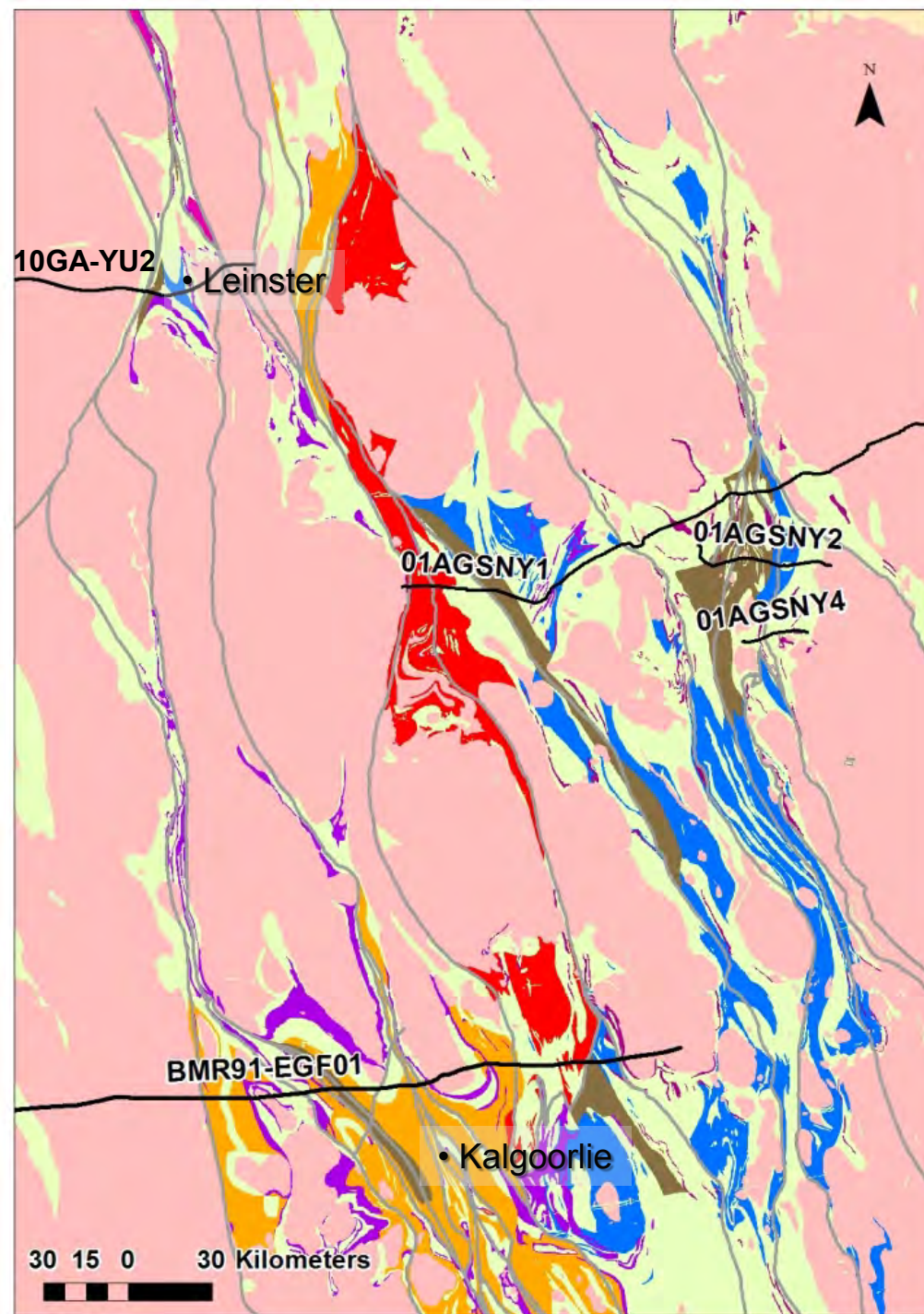
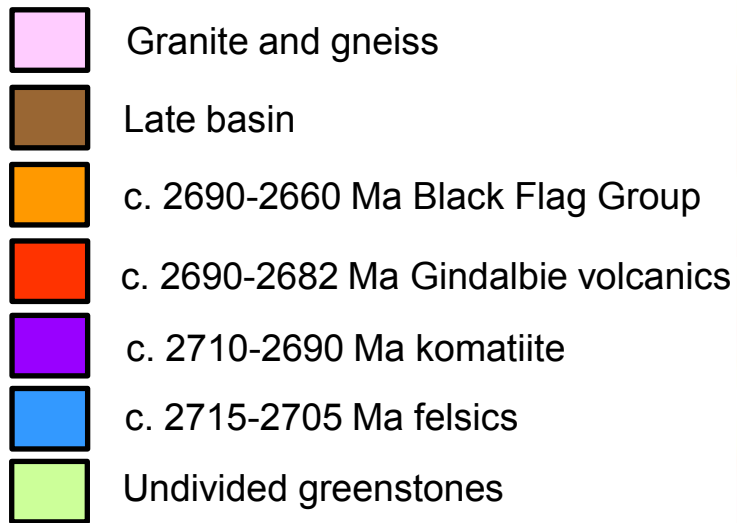
Based on Kambalda stratigraphy

However, some regional variation:  
e.g., may be a second komatiite formation  
below Kambalda Komatiite: Lawlers,  
Coolgardie



# Eastern Goldfields stratigraphy

Asymmetric temporal and geochemical distribution of volcanics



# Eastern Goldfields

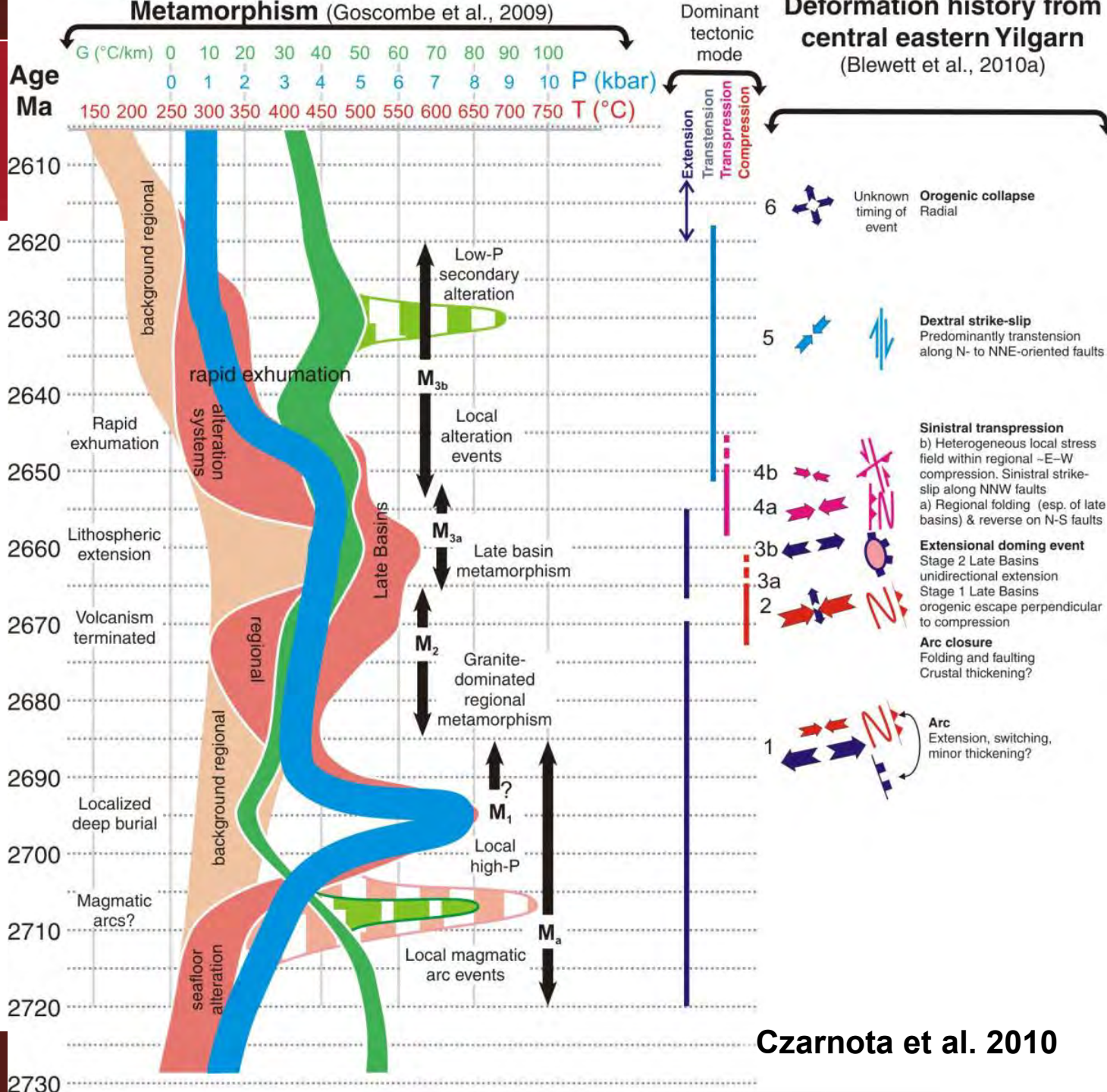
Strike-slip  
(mostly brittle)

Transpression

Extensional doming

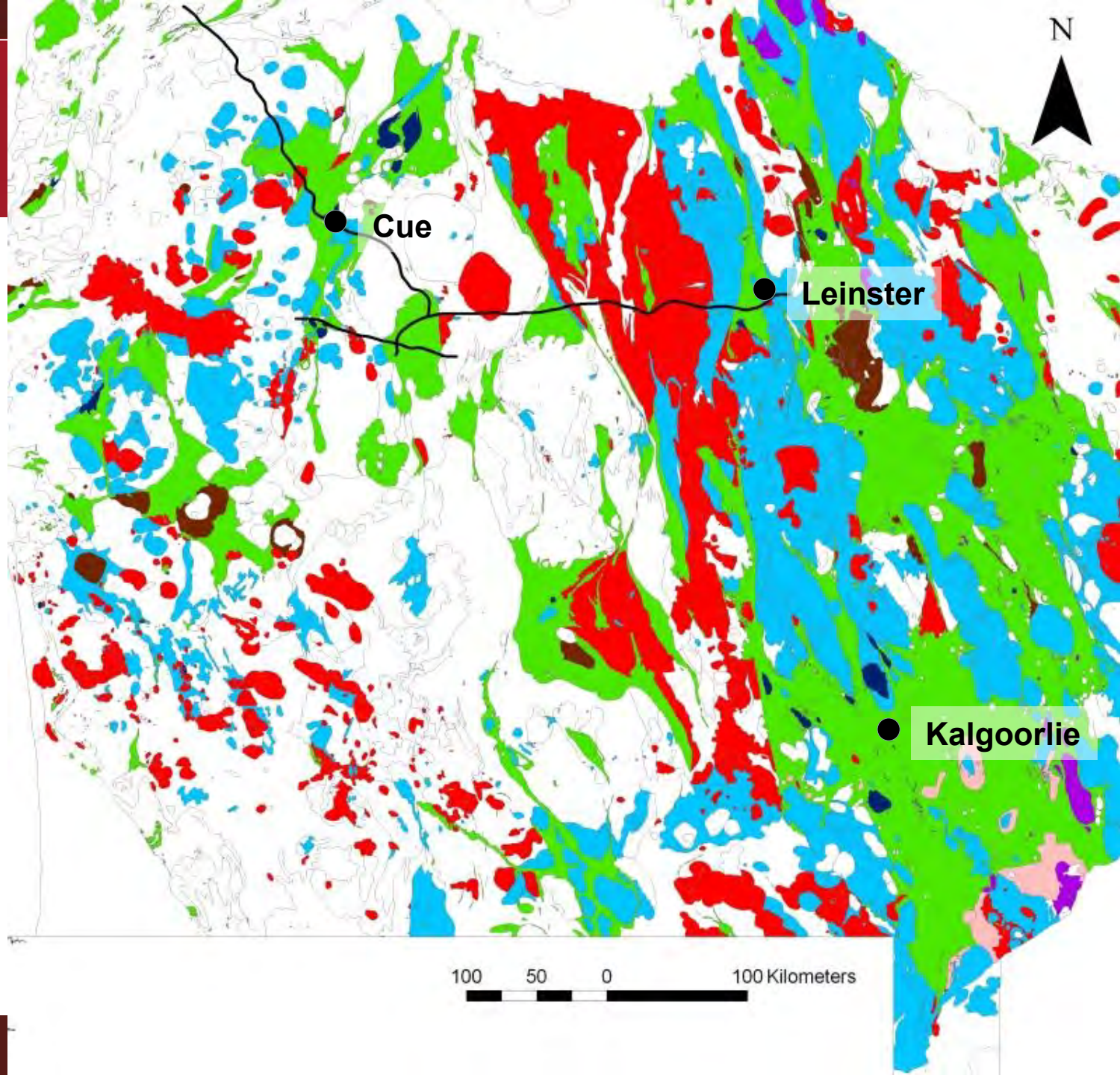
Contraction

Early extension











# Granite



## Granite grouping

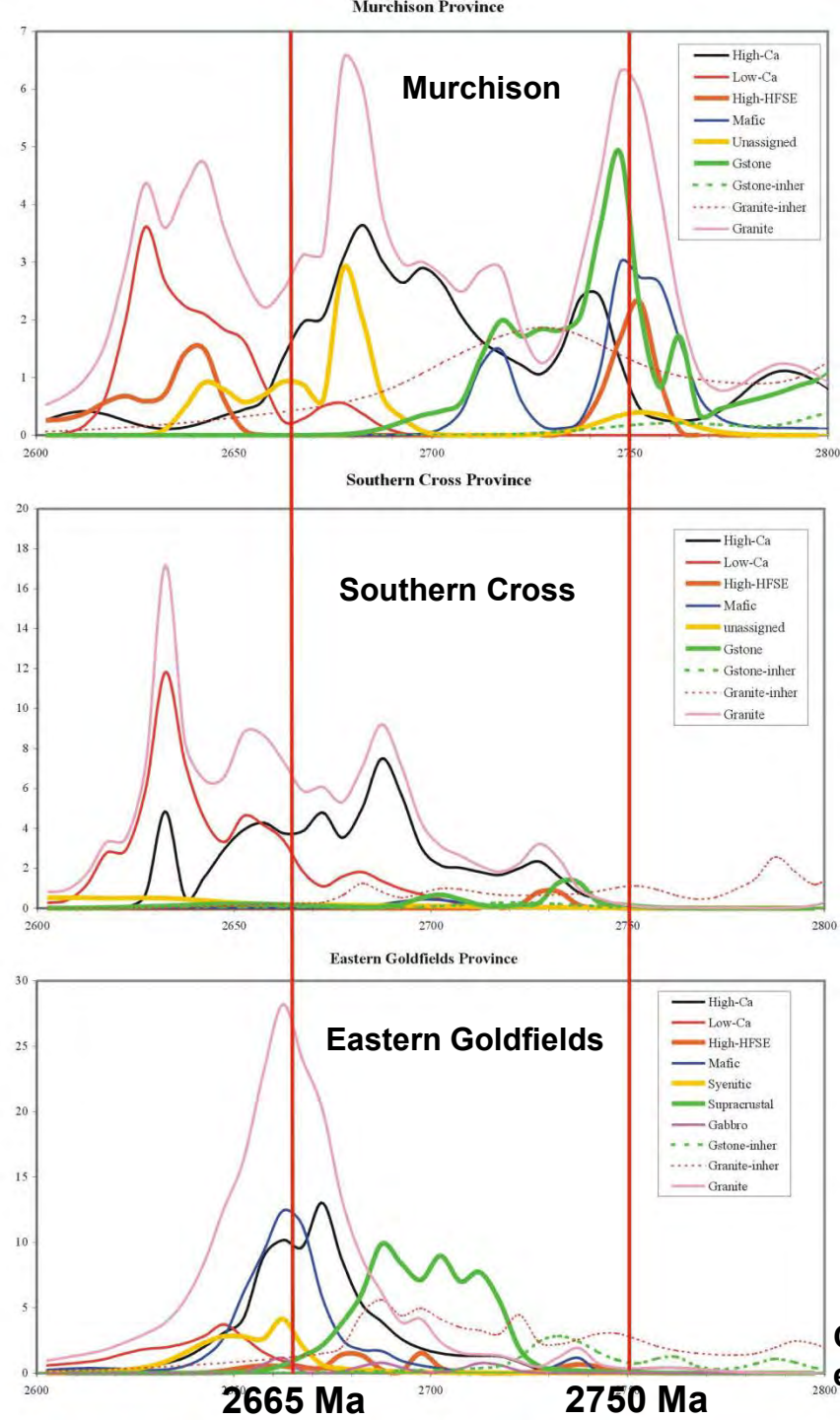
-  Syenitic
-  Low-Ca
-  High-Ca
-  High-HFSE
-  Mafic
-  Greenstone

after Cassidy et al. 2002

100 50 0 100 Kilometers

# Yilgarn granite

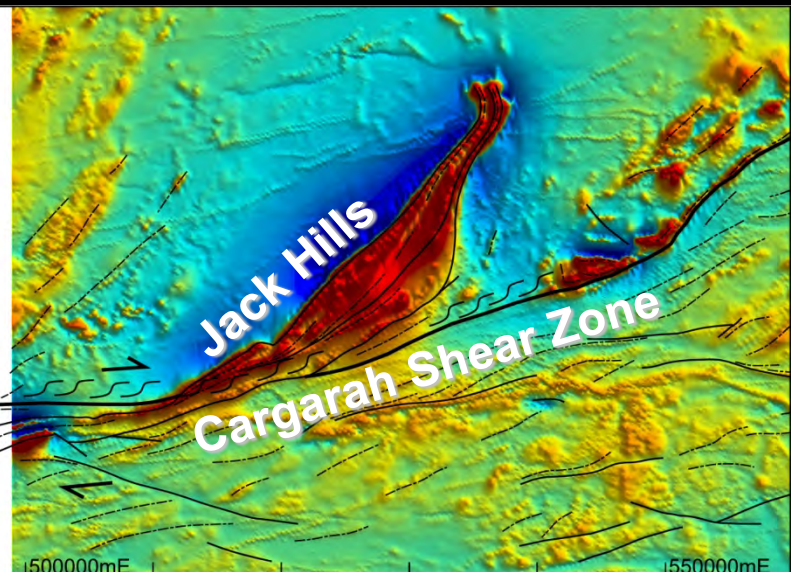
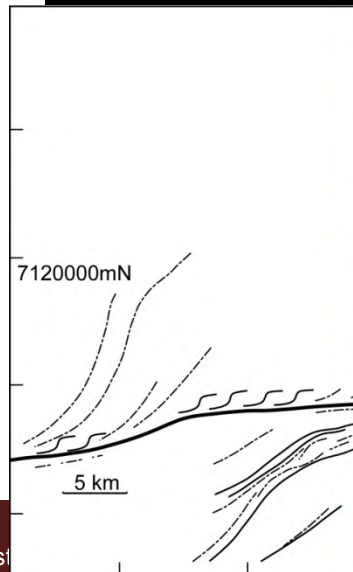
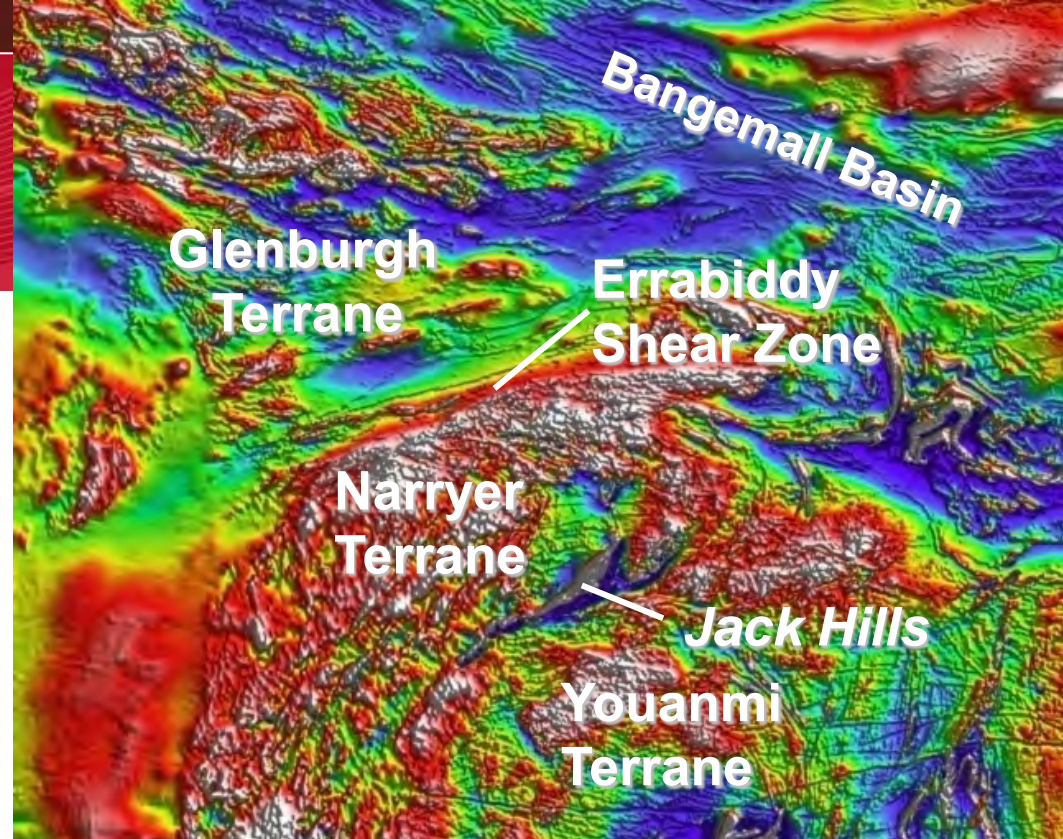
- Longer and more complex granite story in the west
  - reflects volcanic history
- Low-Ca granites appear first in the east and peak later in the west
  - crustal melts



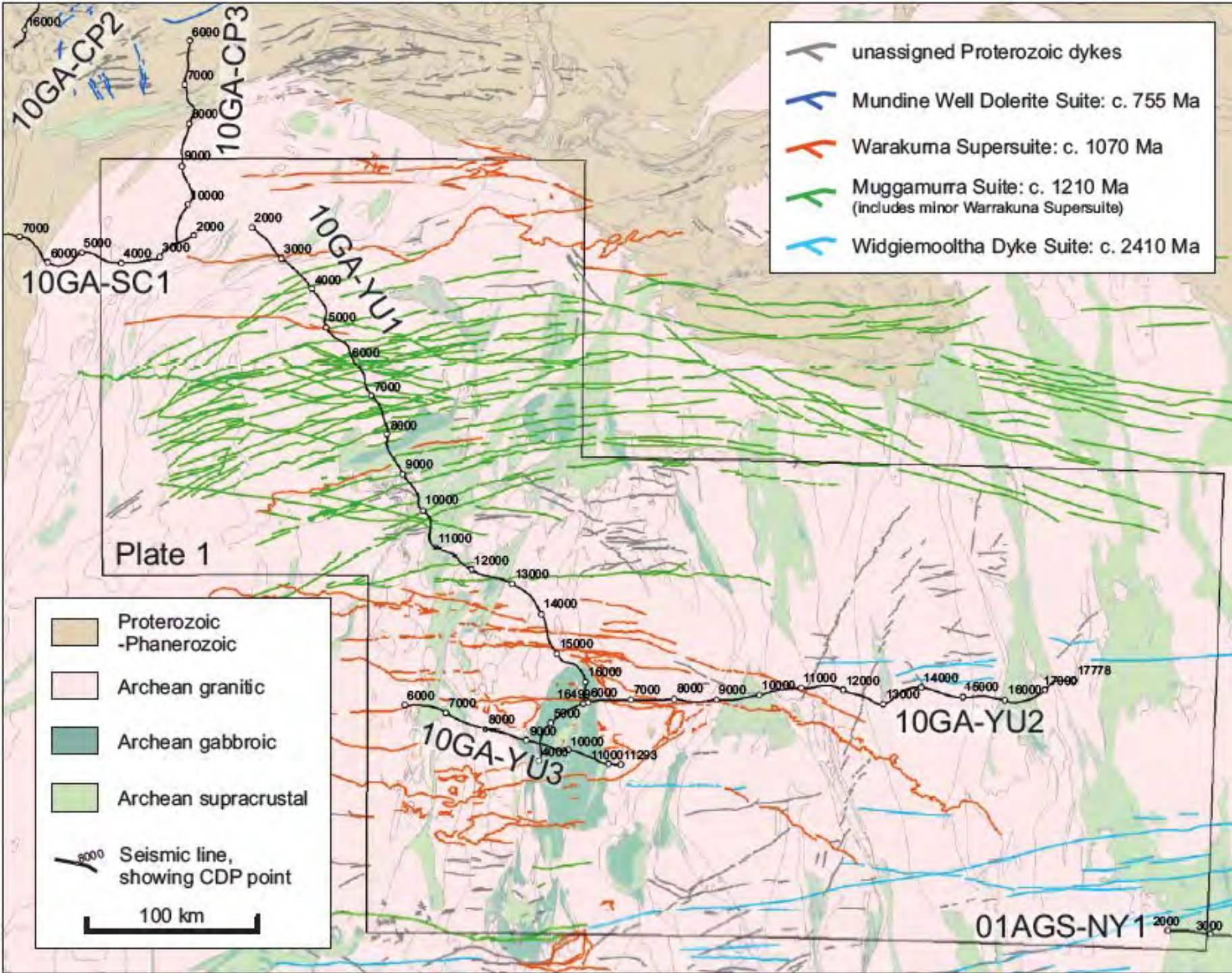
Champion  
et al. 2002

# NW craton margin

- Collisional Glenburgh Orogeny (2005–1950): Errabiddy Shear Zone
- Yalgah Fault/Cargarah Shear Zone?
- Repeated reactivation, e.g. Capricorn Orogeny (1820–1770); granite magmatism



modified from Spaggiari 2007













-  unassigned Proterozoic dykes
-  Mundine Well Dolerite Suite: c. 755 Ma
-  Warakuma Supersuite: c. 1070 Ma
-  Muggamurra Suite: c. 1210 Ma  
(includes minor Warrakuna Supersuite)
-  Widgiemooltha Dyke Suite: c. 2410 Ma

Plate 1

-  Proterozoic-Phanerozoic
  -  Archean granitic
  -  Archean gabbroic
  -  Archean supracrustal
  -  Seismic line, showing CDP point
- 100 km

01AGS-NY1 2000 3000

# WARAKURNA LIP c. 1070 Ma

