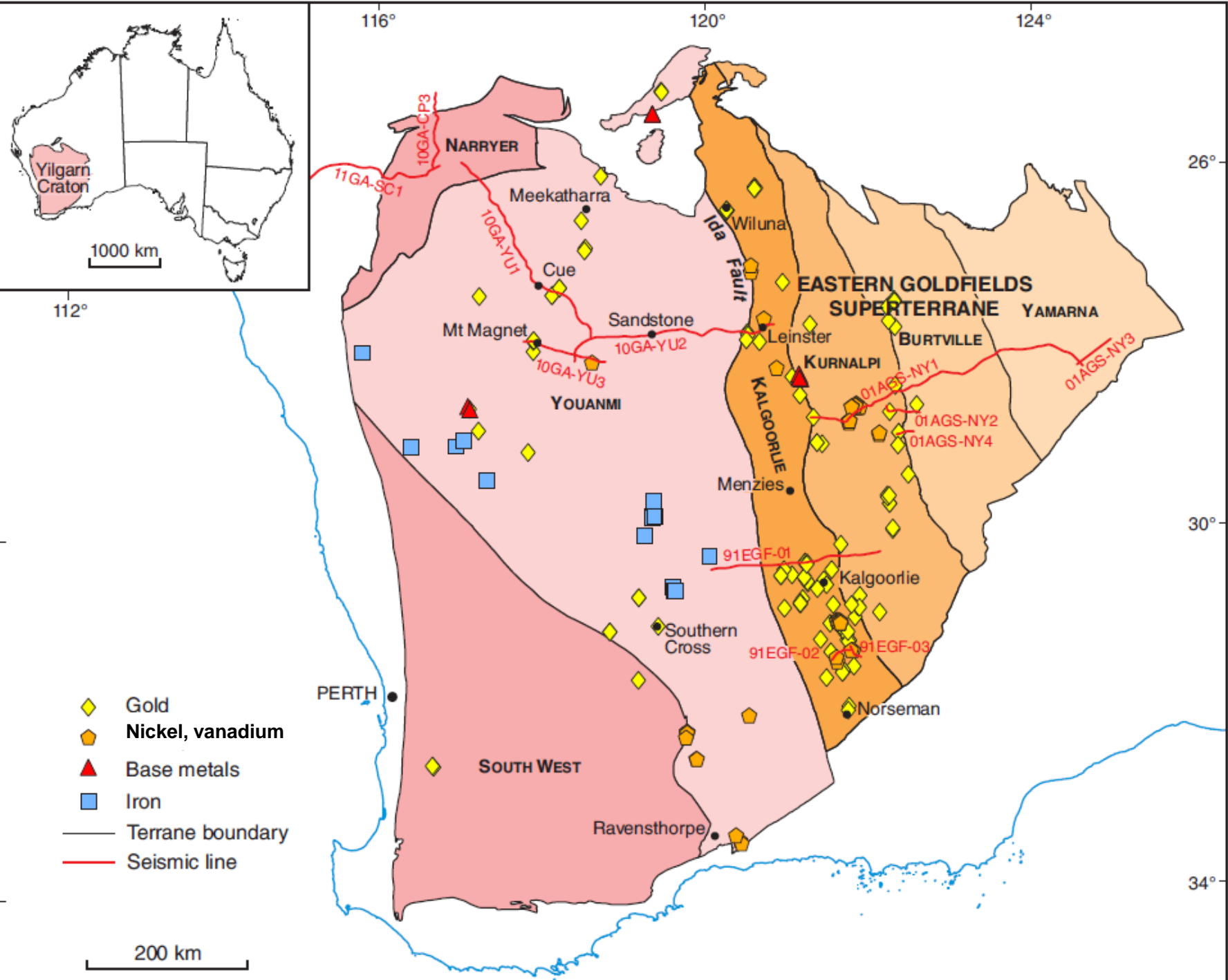


Youanmi seismic and MT: implications for gold-bearing systems

Stephen Wyche, Tim Ivanic, Ivan Zibra, Klaus Gessner,
Michael Doublier, Russell Korsch and Richard Blewett



pmd**CRC* questions



1. Geodynamic (stratigraphy, structural, metallogenic and *P-T-t* history)
2. Architecture
3. Fluid sources and reservoirs
4. Fluid flow drivers and pathways
5. Metal transport and deposition

Barnicoat et al. 2007

pmd**CRC* questions



1. Geodynamic (stratigraphy, structural, metallogenic and P-T-*t* history)
- 2. Architecture — gold**
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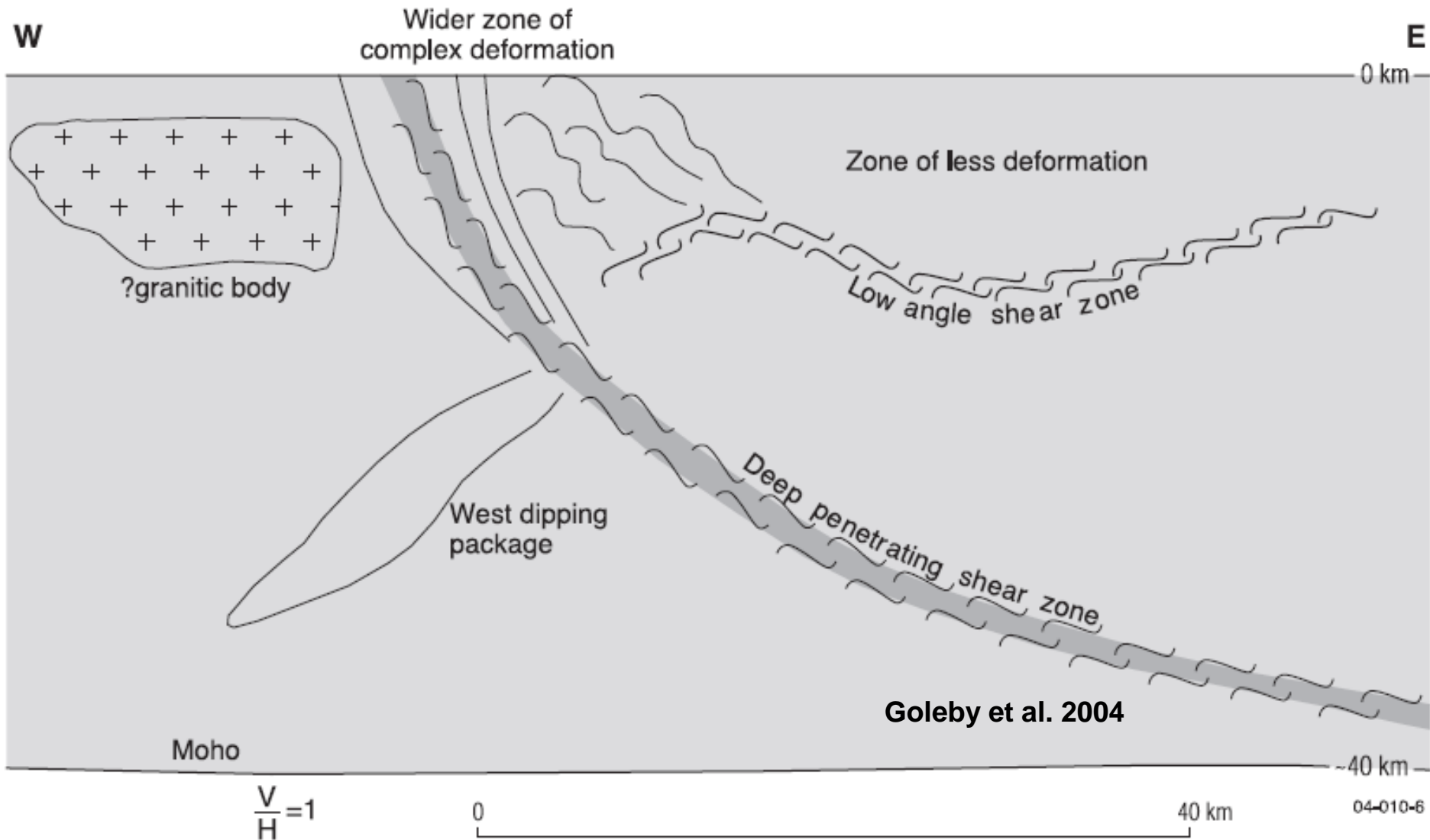
Barnicoat et al. 2007

Yilgarn gold

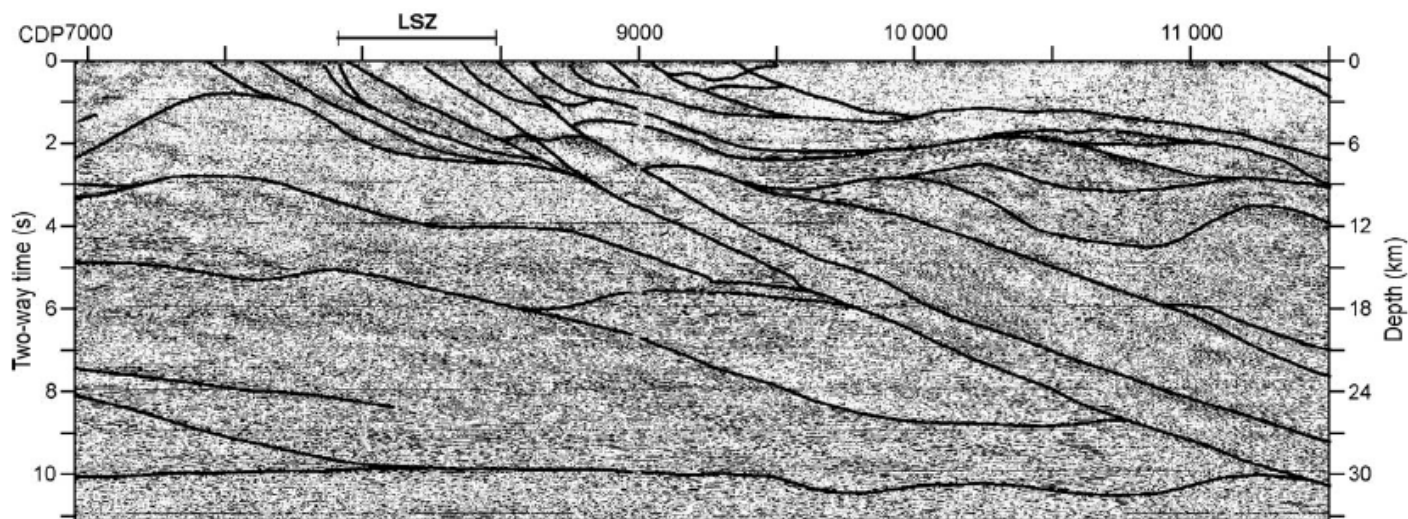
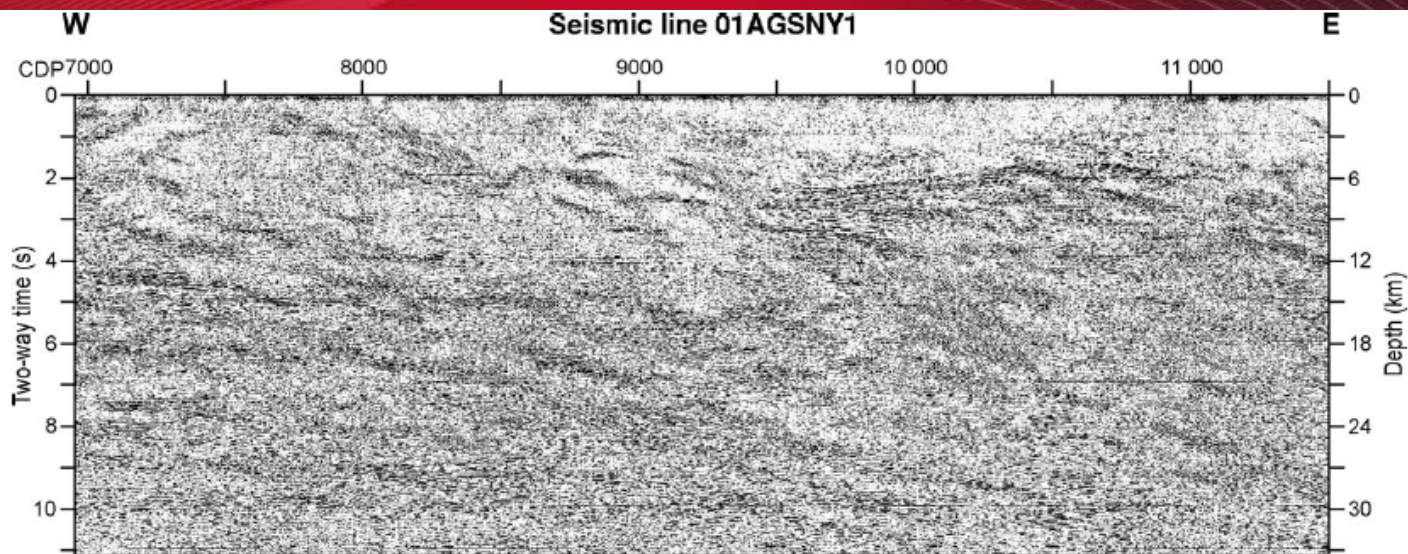


1. Late: after c. 2700 Ma
 - Mostly after c. 2670 Ma
2. Likely multiple mineralizing events
3. Relationship with granites
 - Switch from high-Ca to low-Ca granites
4. Scale of structures visible in seismic data

What are we looking for?



Deeply penetrating shear zone



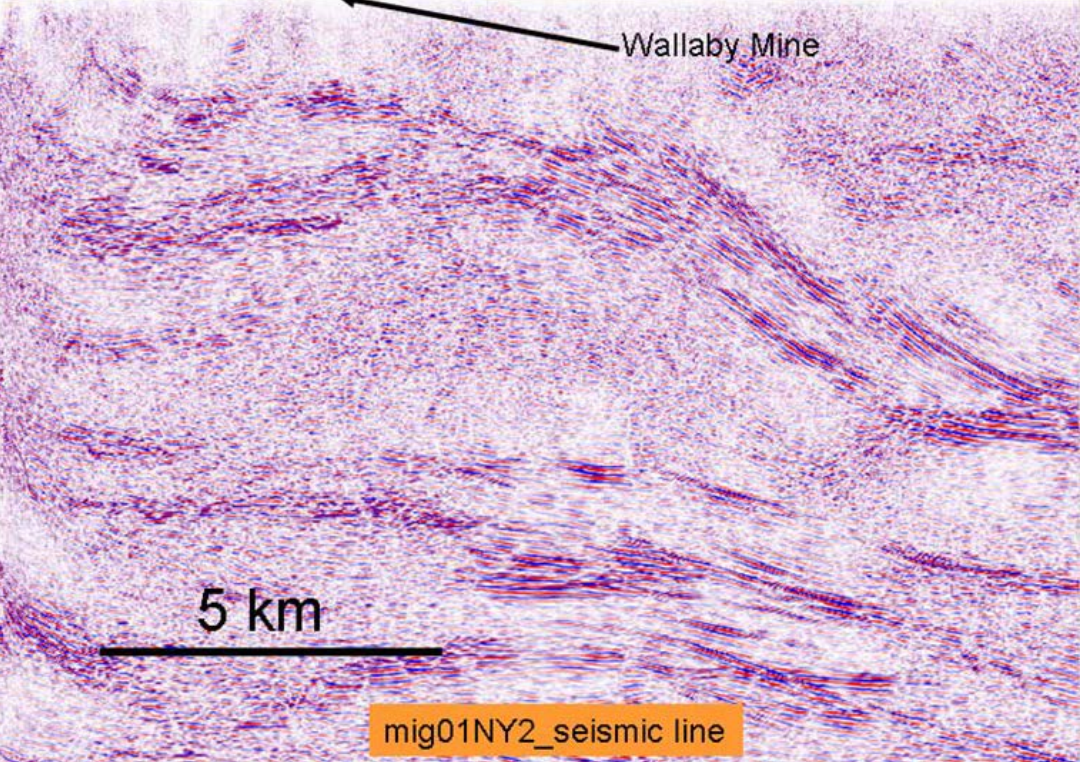
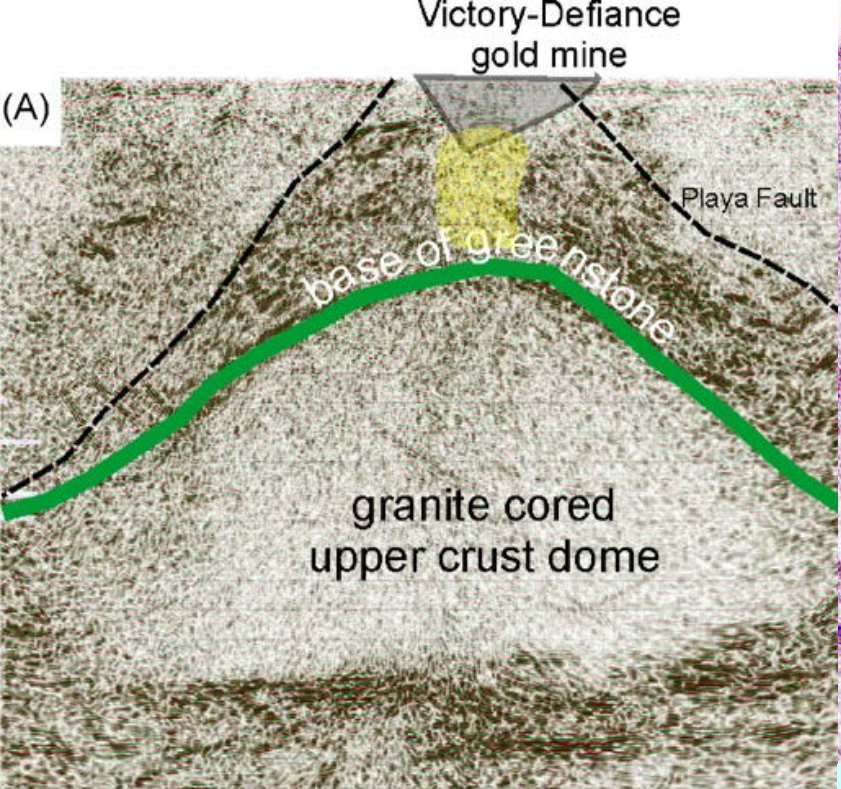
Laverton Shear Zone

$$\frac{V}{H} = 1$$

0 20 km

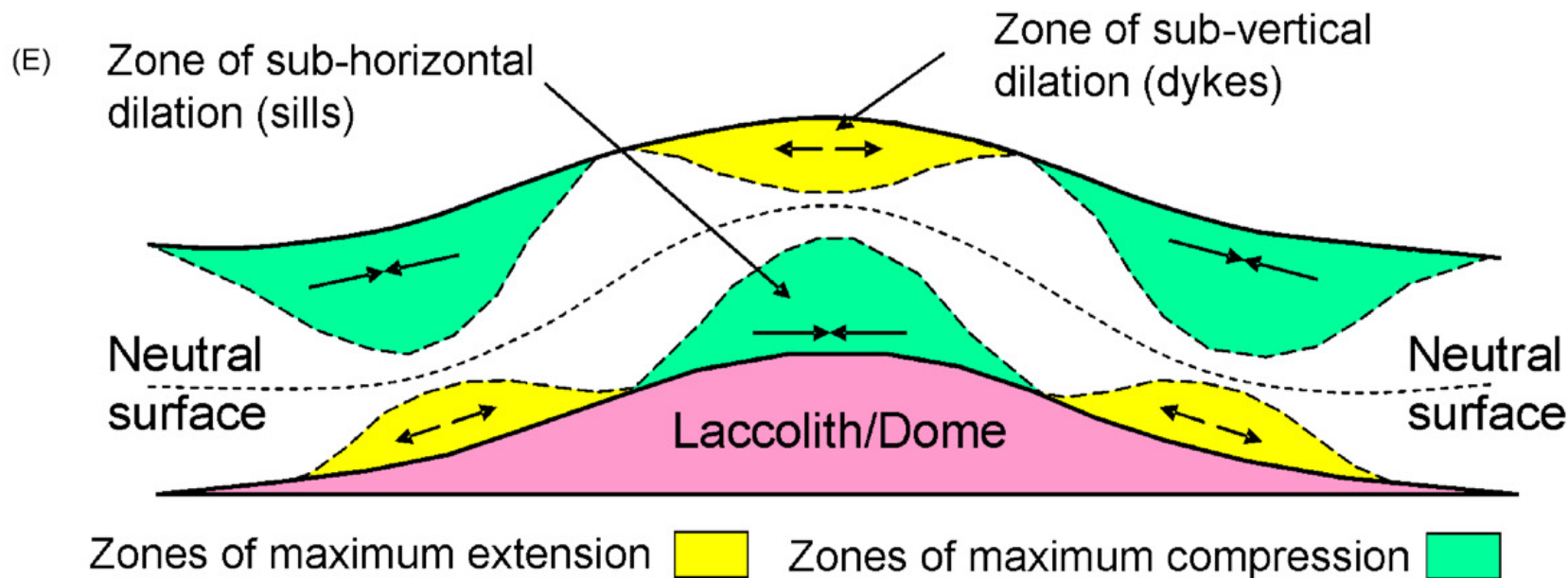
Goleby et al. 2004

04-010-4

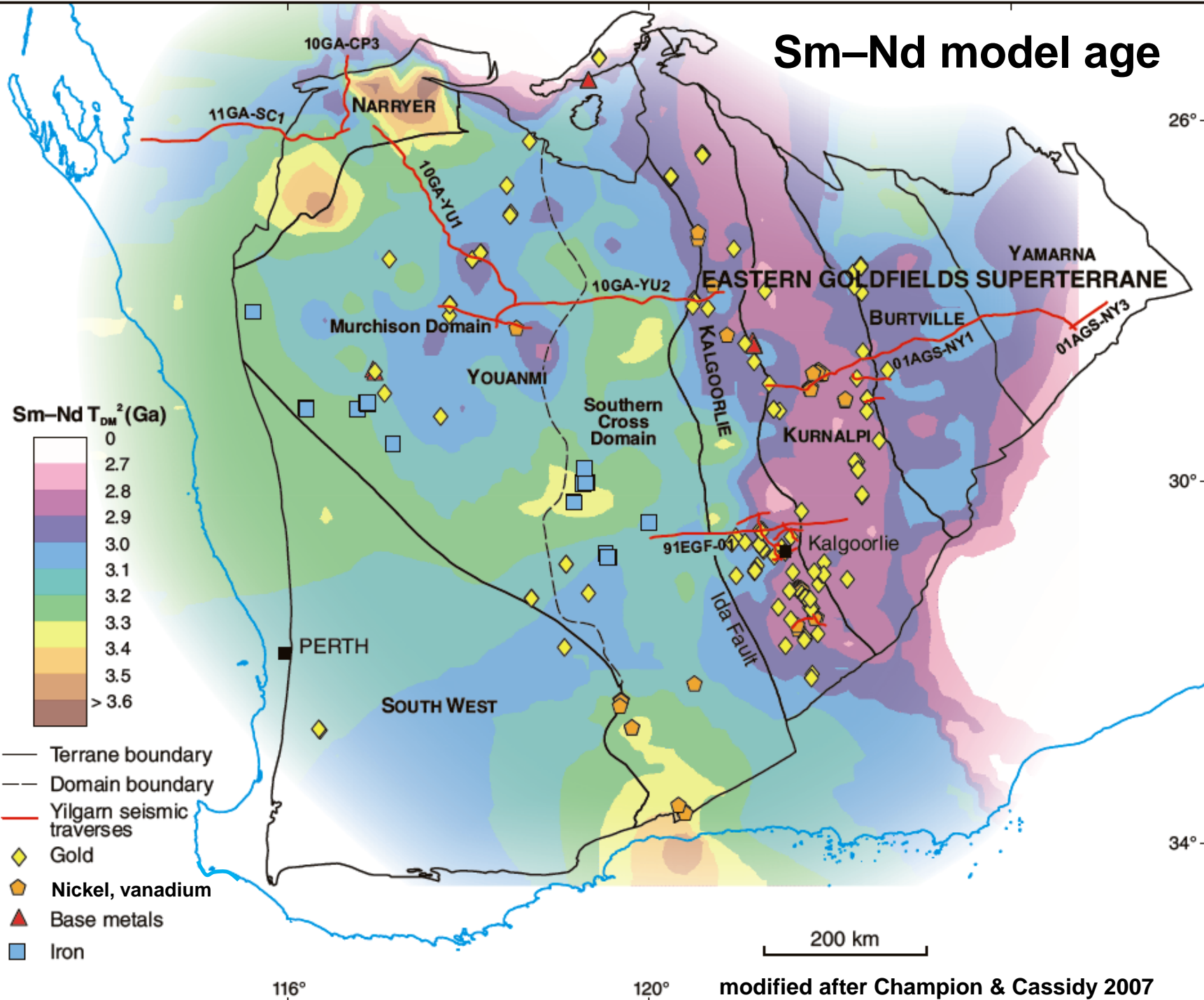


Blewett & Hitchman 2006; Blewett et al. 2010

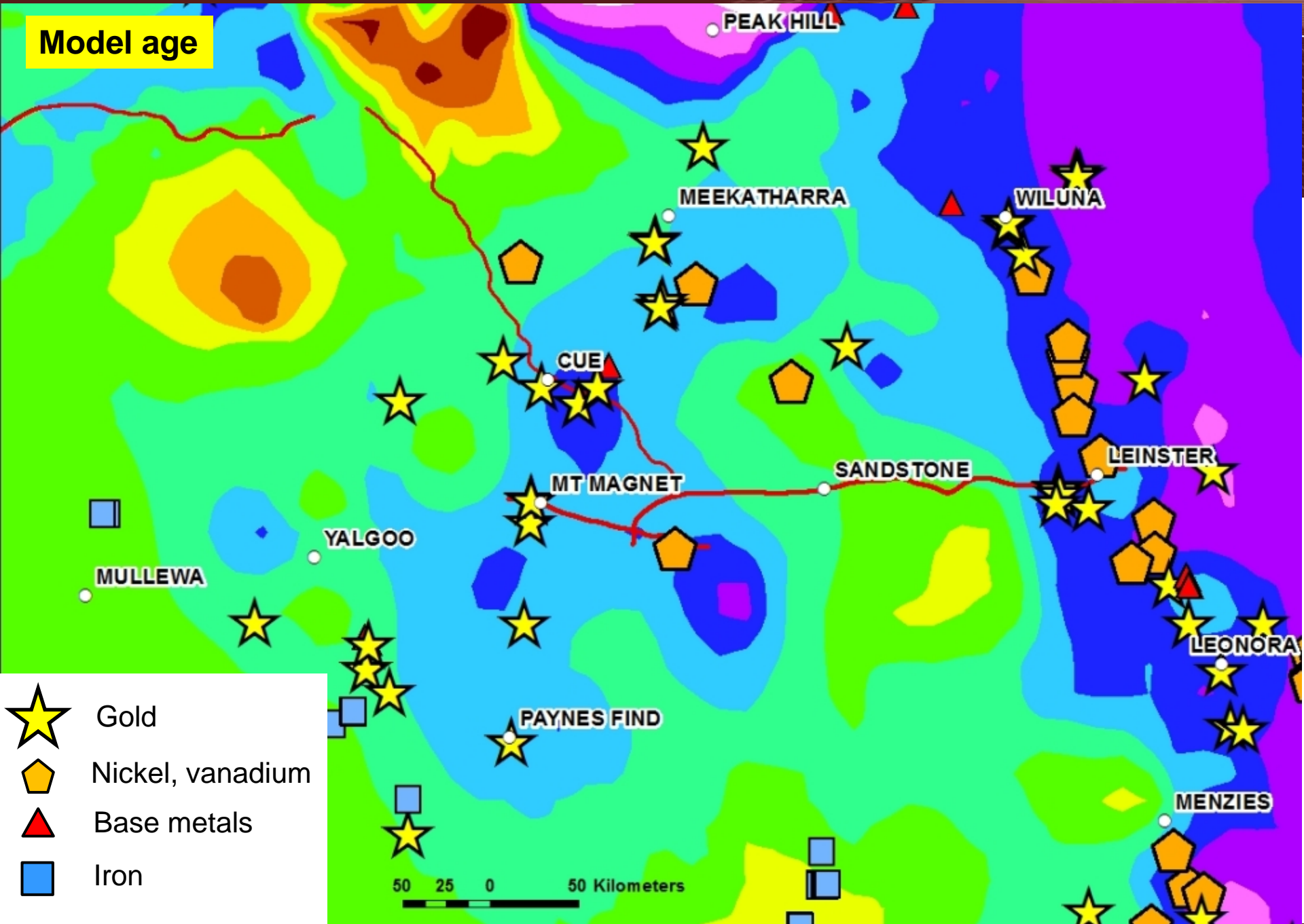
Image from Gold Fields St Ives



Sm–Nd model age



Model age



- ★ Gold
- ⬠ Nickel, vanadium
- ▲ Base metals
- Iron

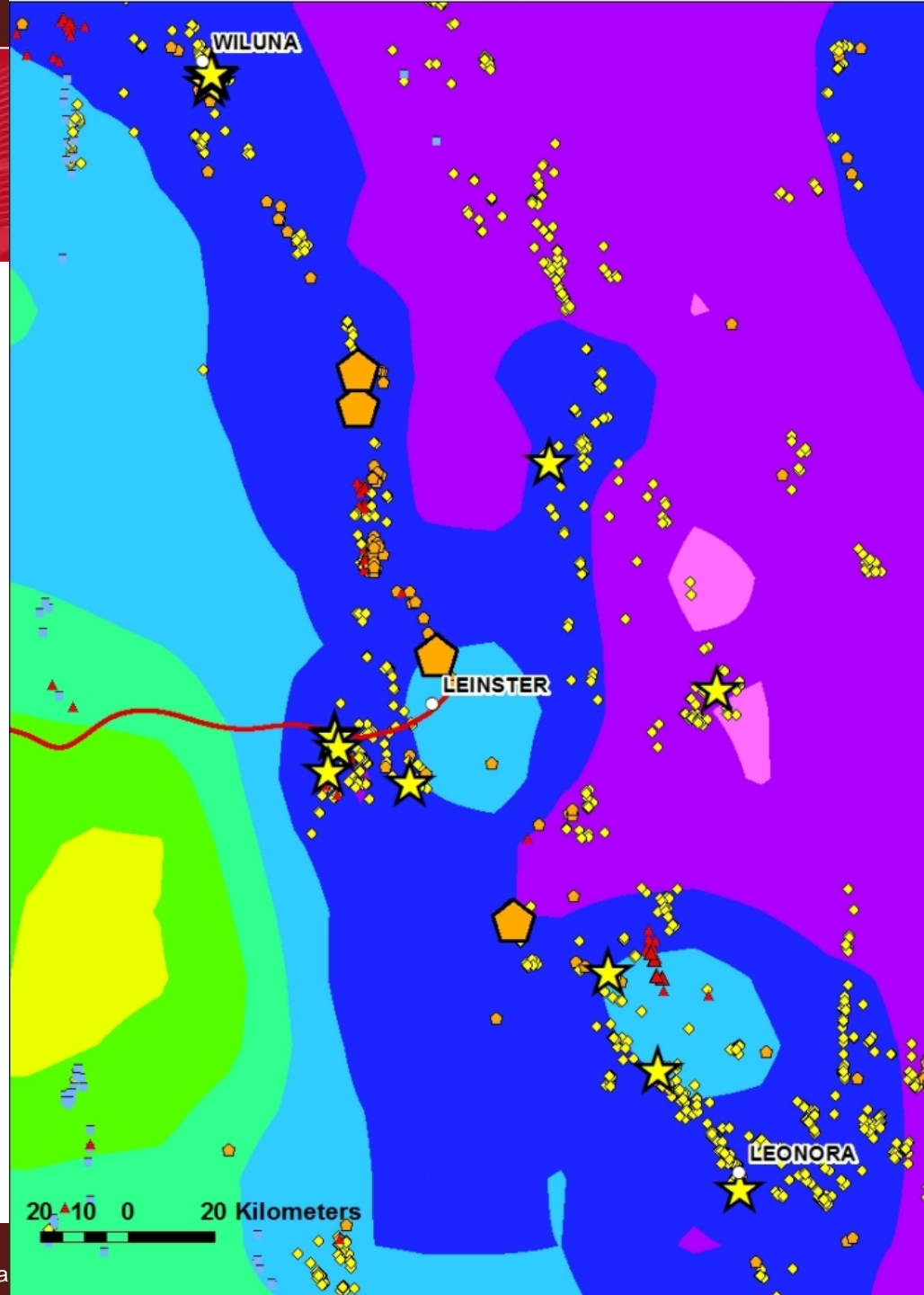
50 25 0 50 Kilometers

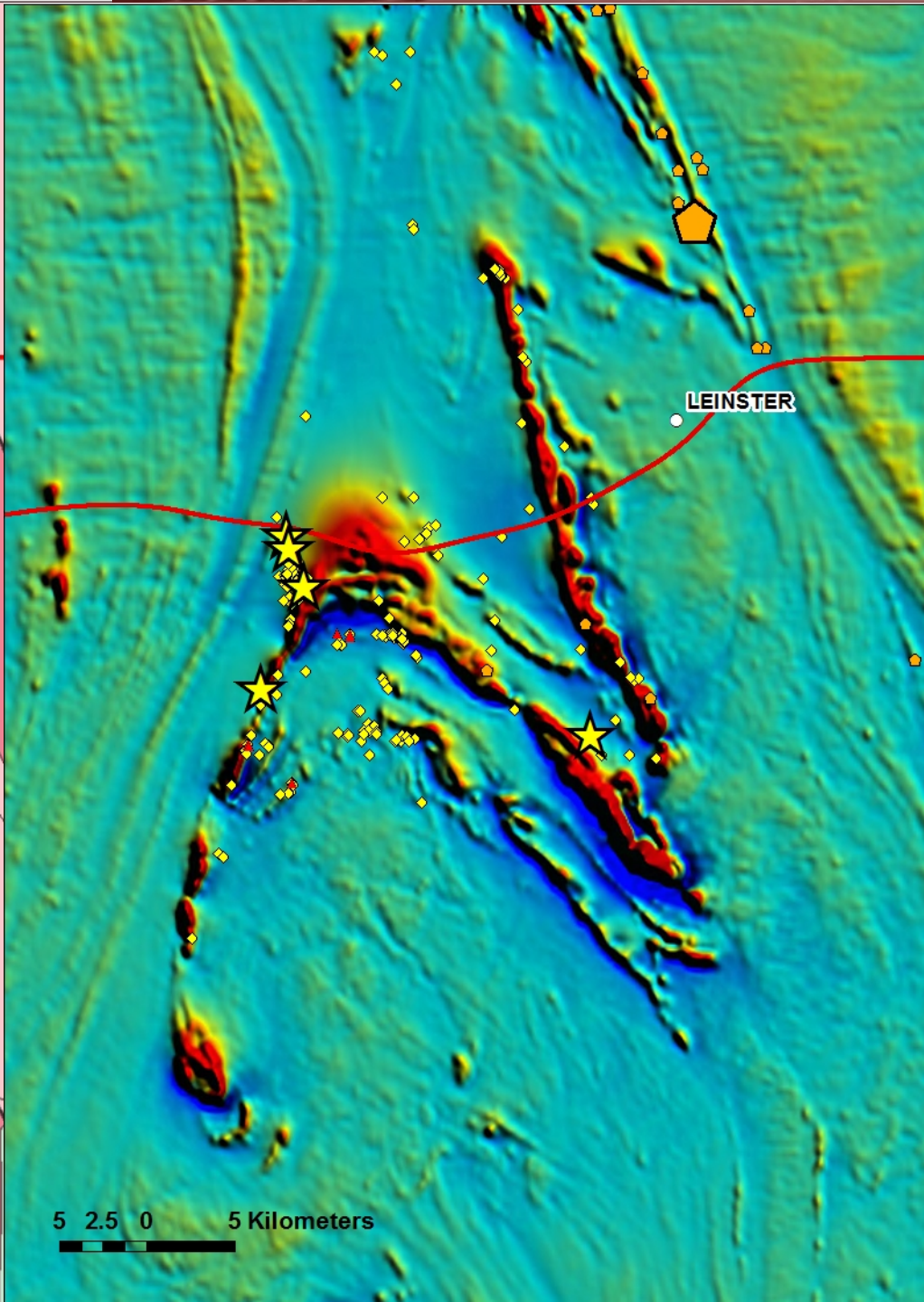
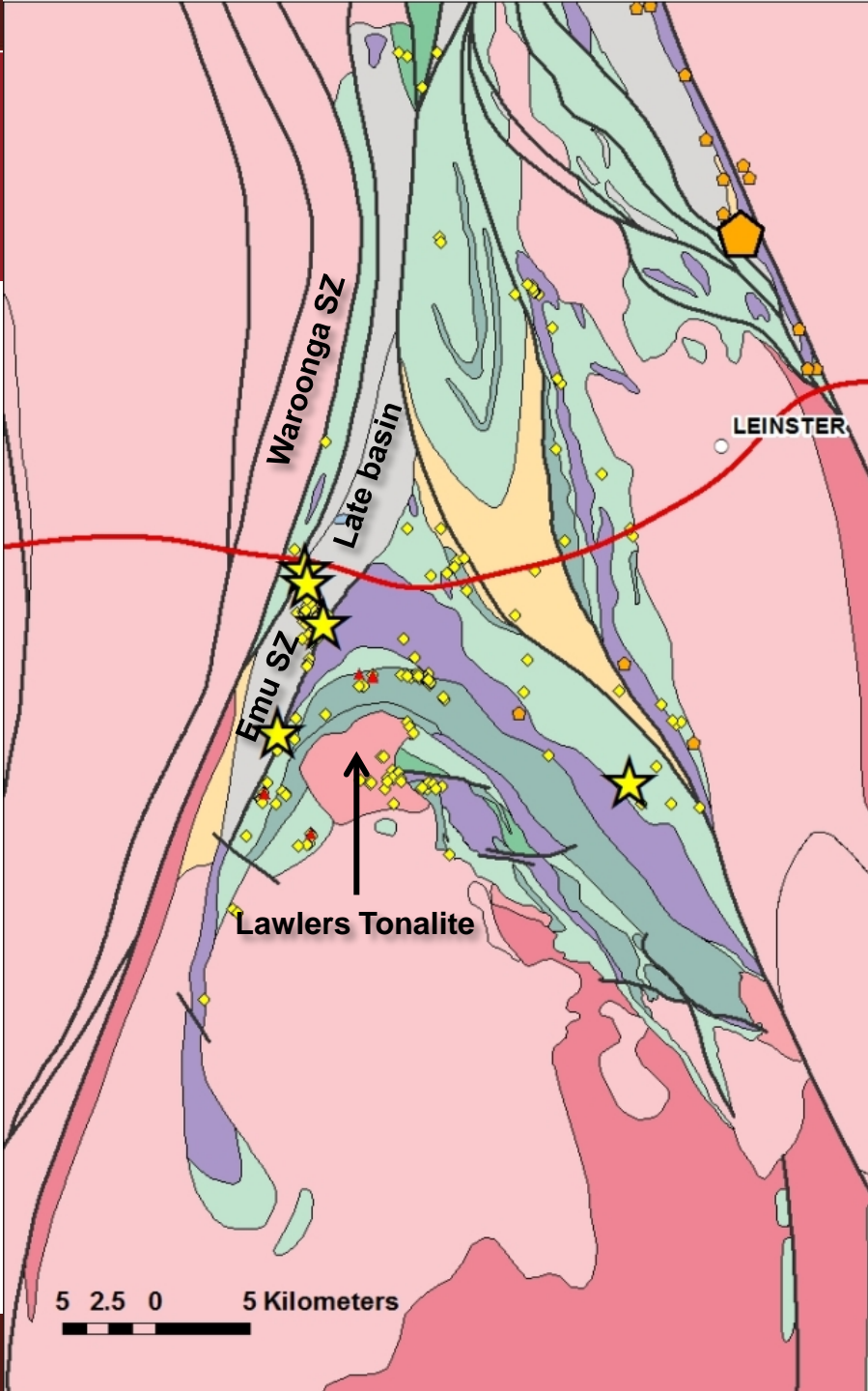
Lawlers region

Strong correspondence with juvenile crust

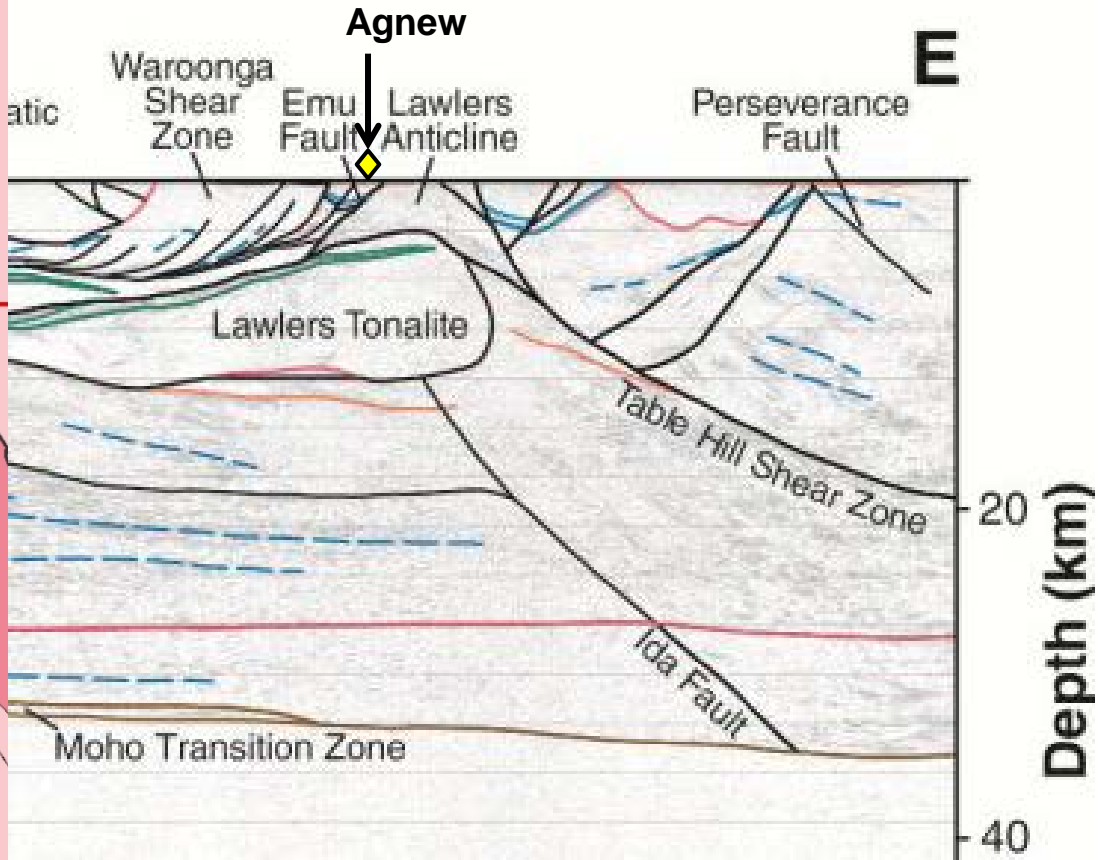
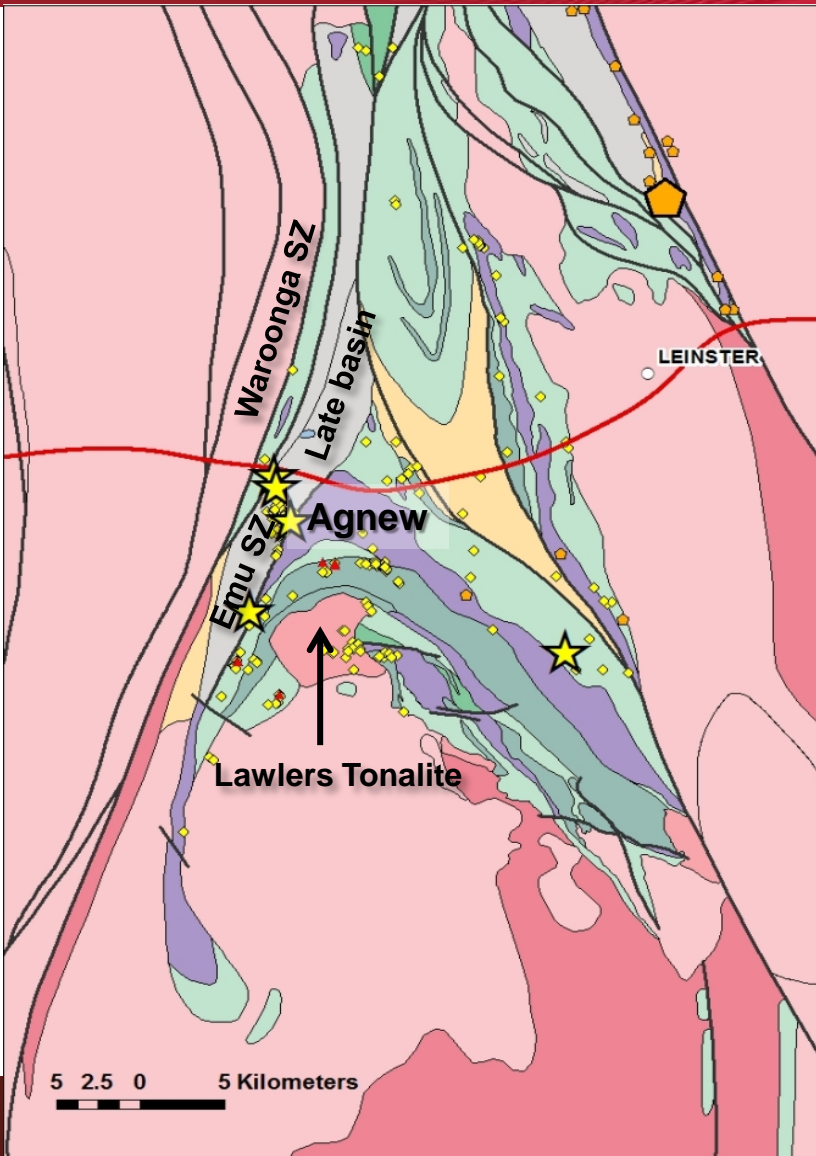
Bigger deposits abundant near terrane margin

235 t Au (Robert et al. 2005)





Lawlers Anticline and Ida Fault



All ingredients present

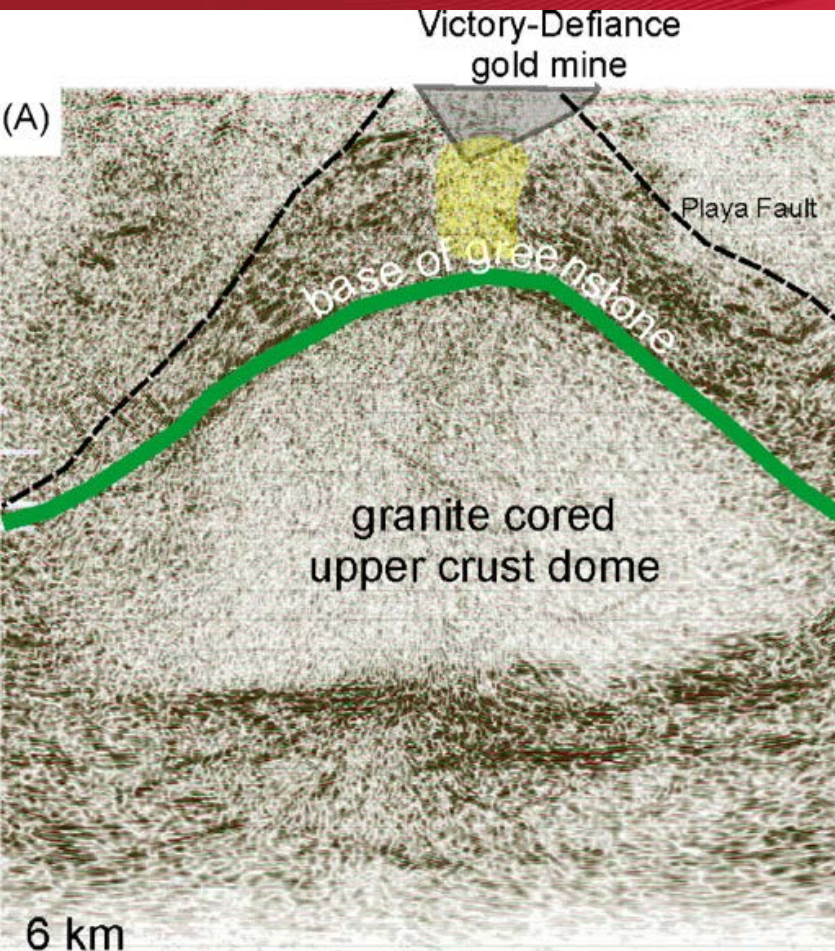
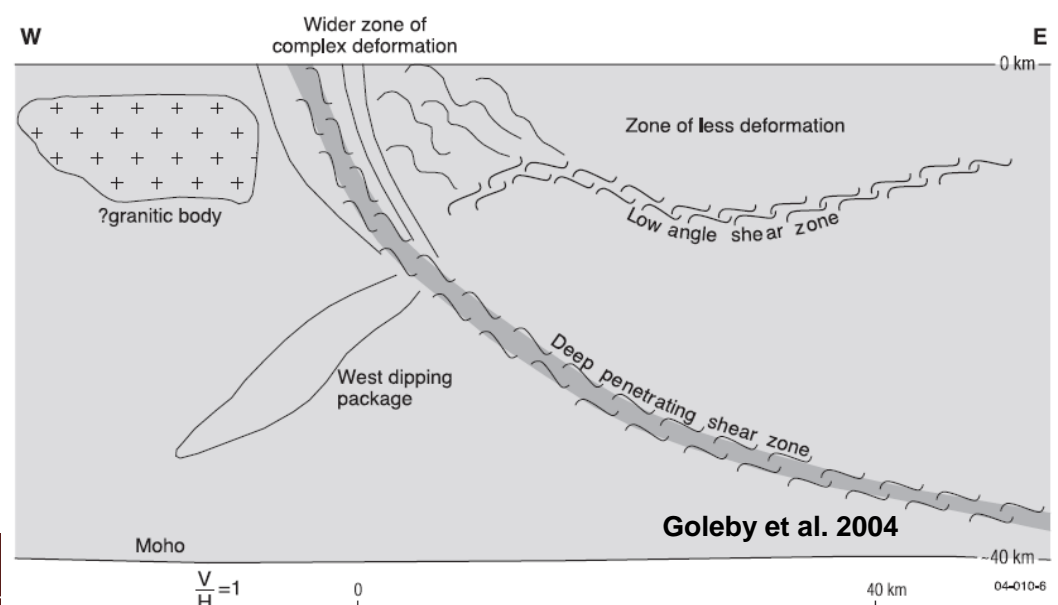
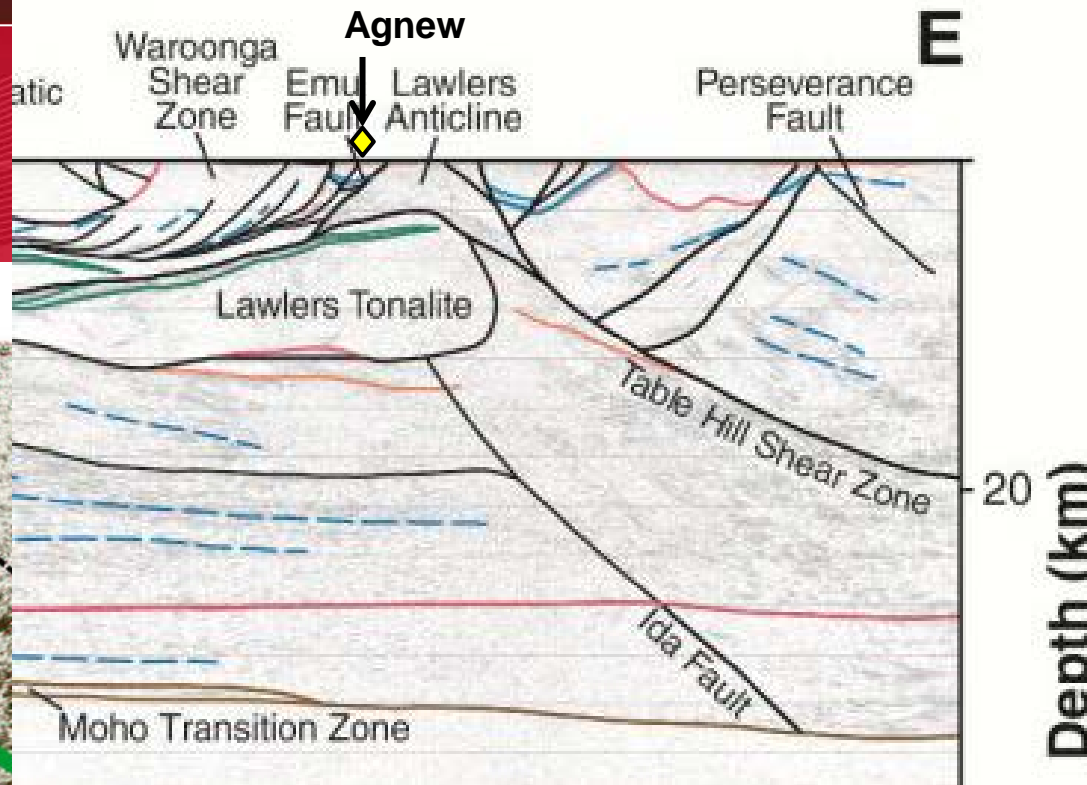
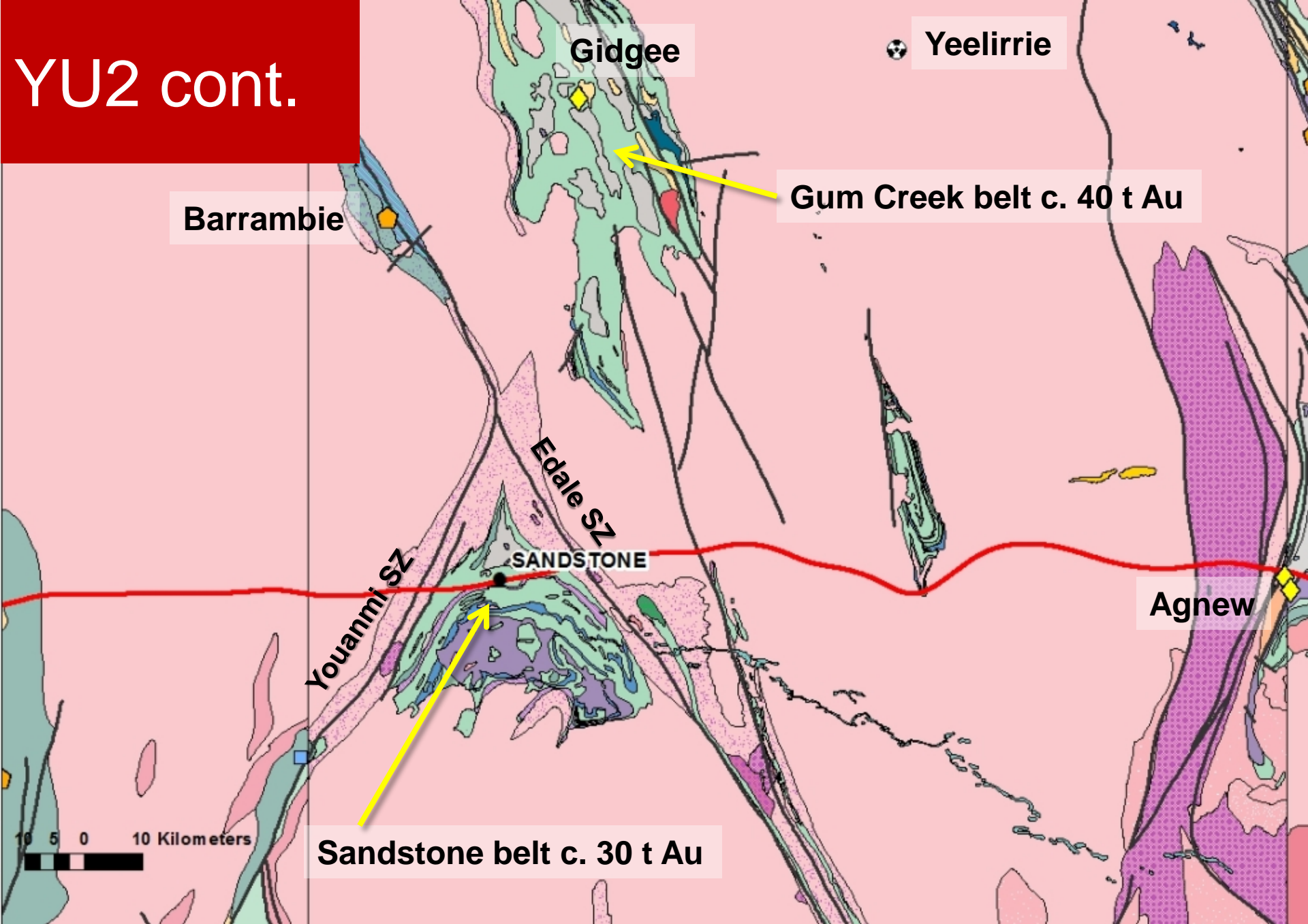


Image from Gold Fields St Ives **Blewett et al. 2010**



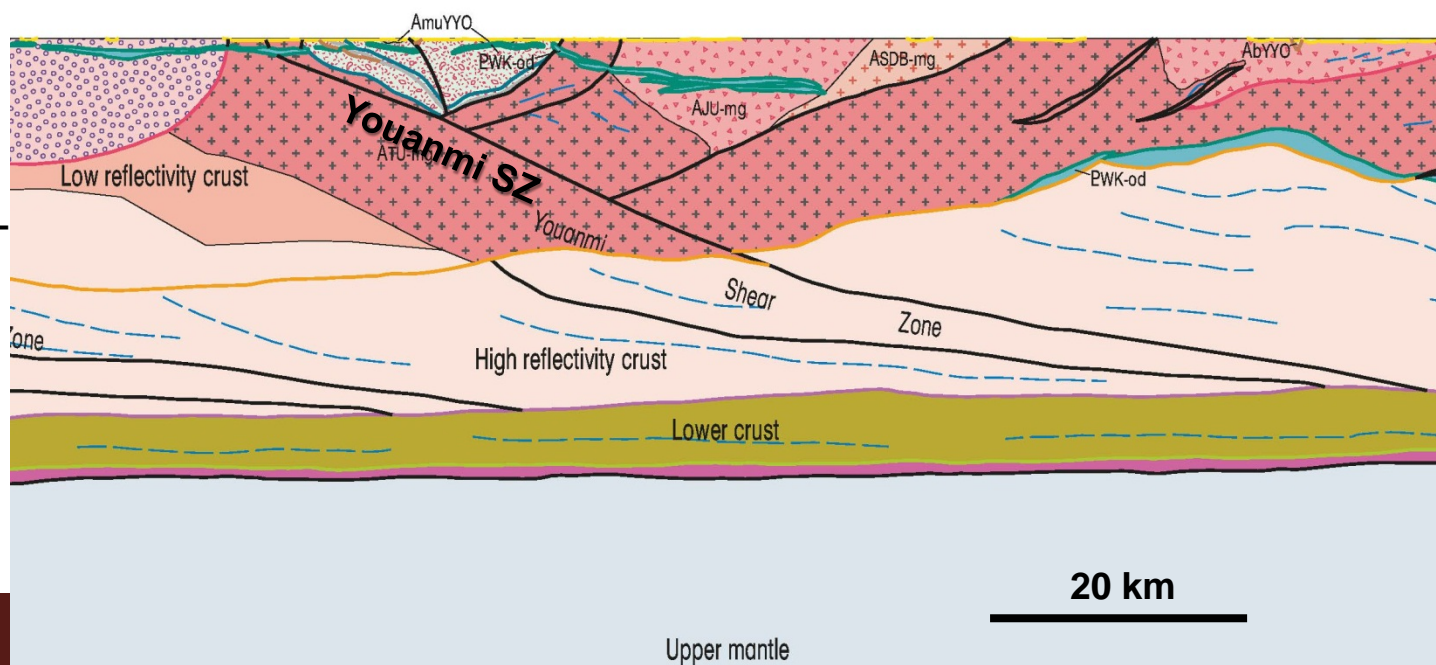
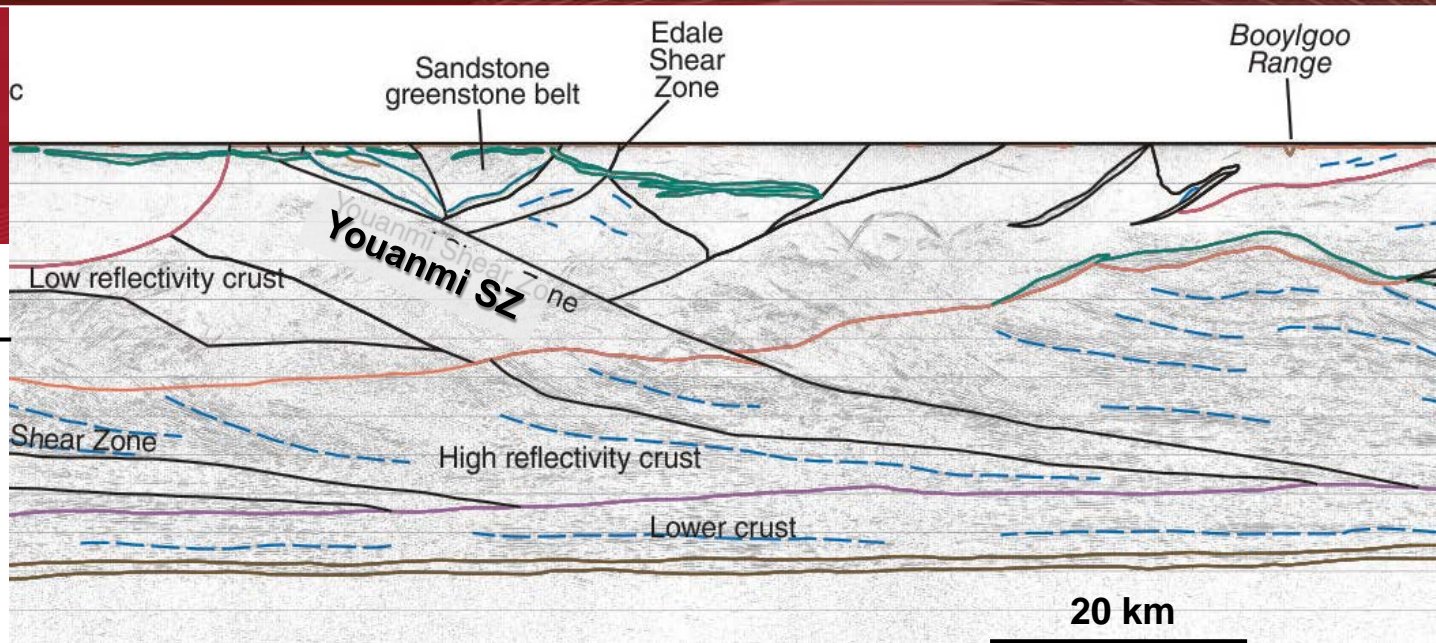
Goleby et al. 2004

YU2 cont.

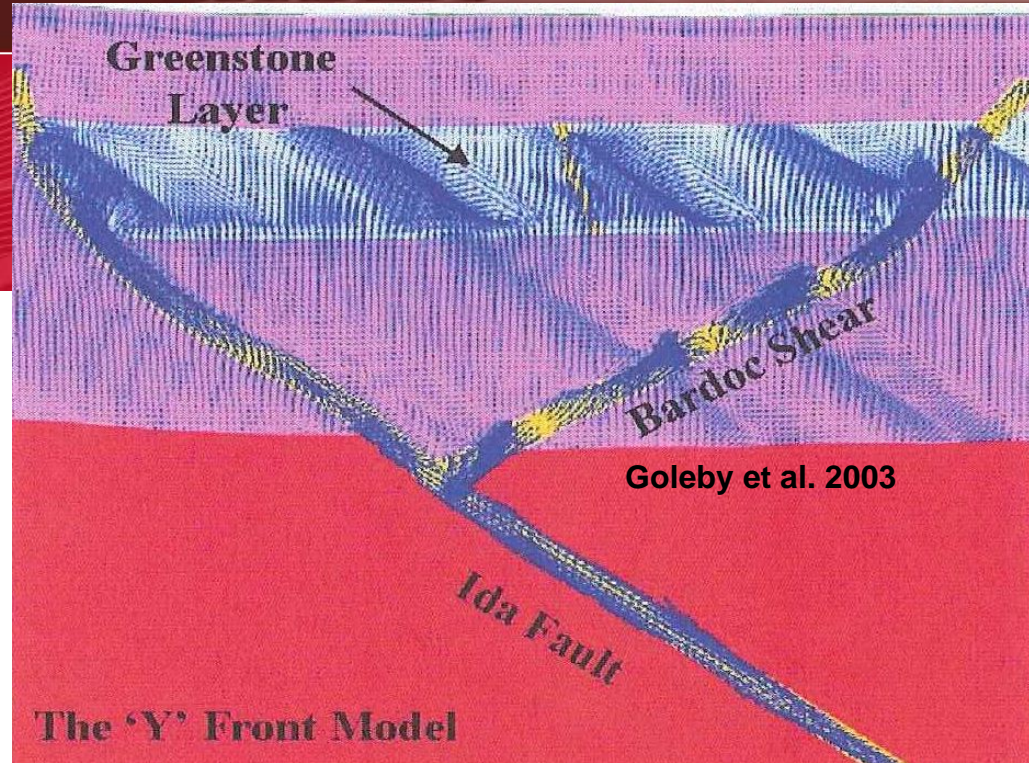


Youanmi shear zone

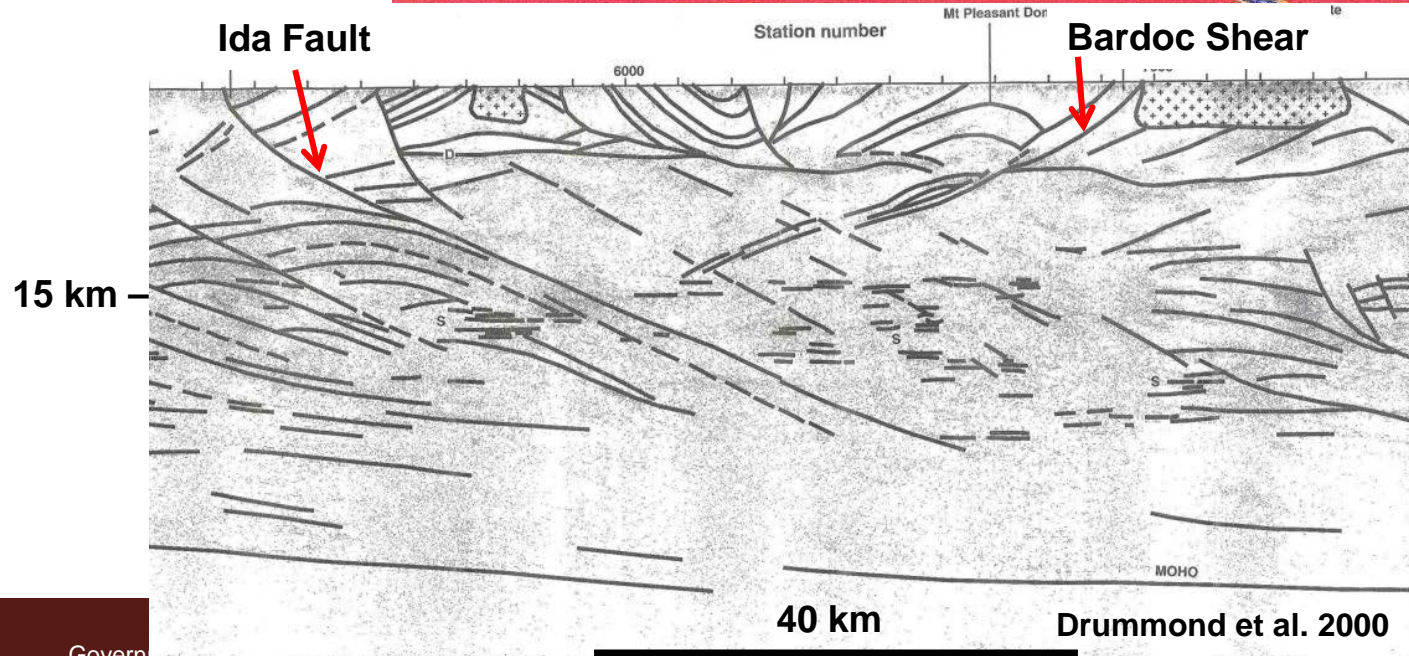
Penetrates to lower crust



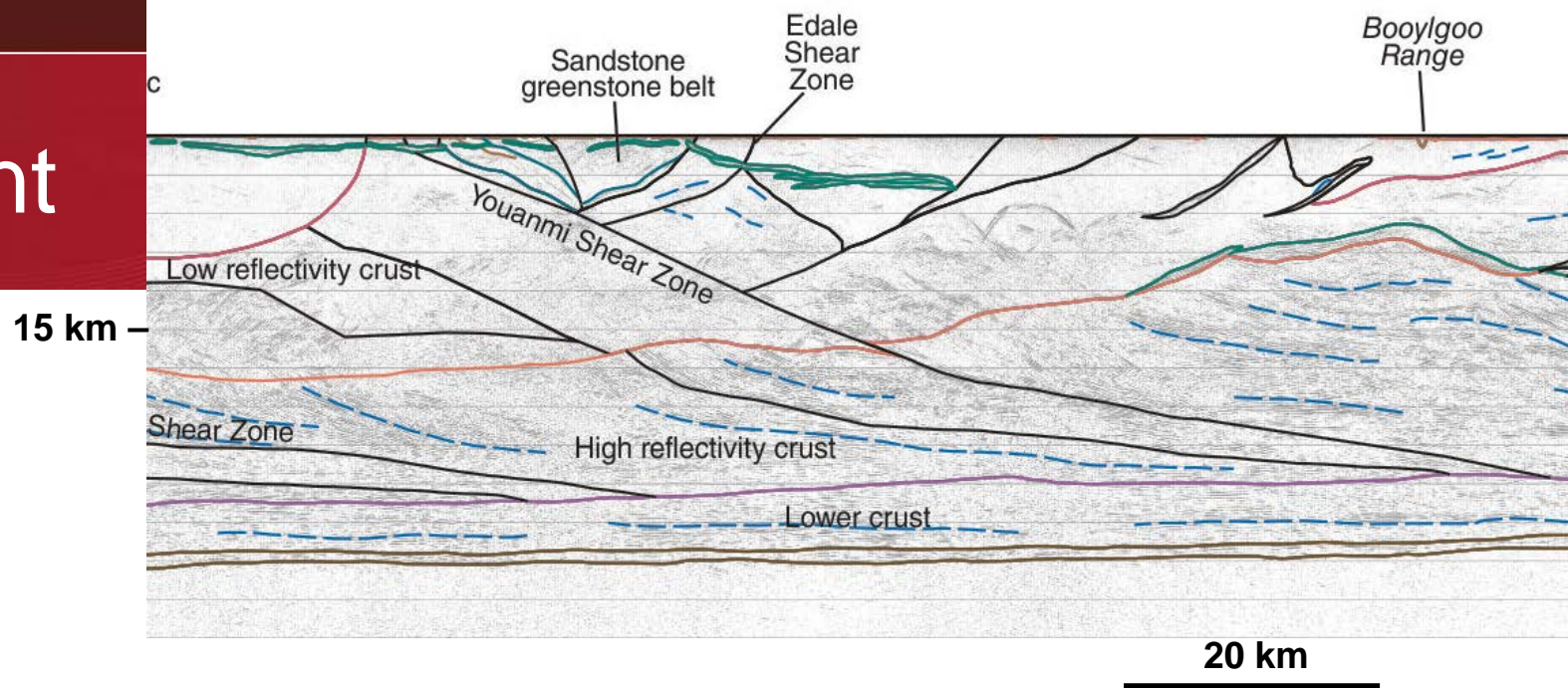
Y-front model



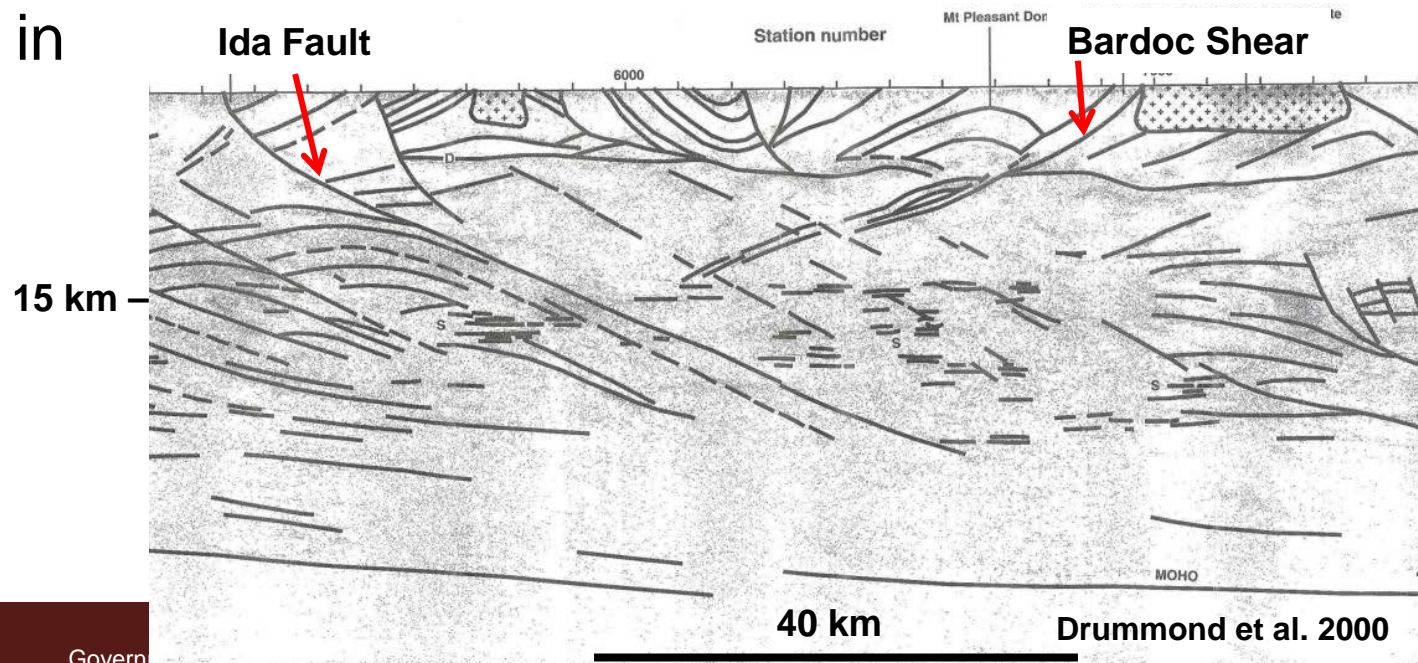
Linked fluid pathway model



Y-front

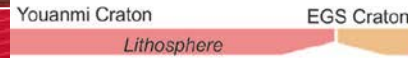


Why so little gold in the north of the Southern Cross Domain?



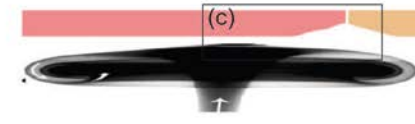
No access to suitable fluid source?

(a) Ascending starting plume beneath Youanmi Craton

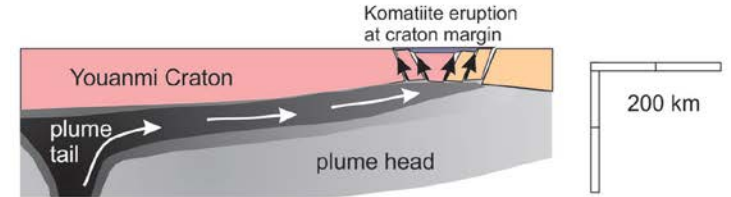


200 km

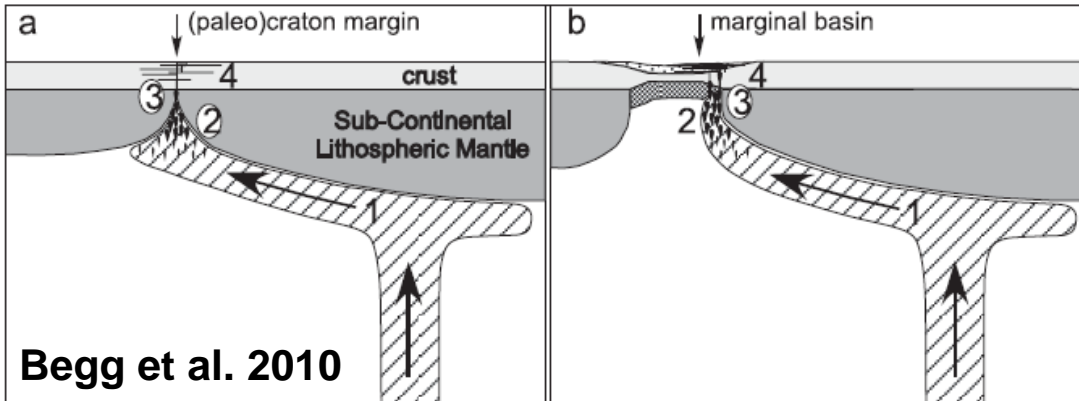
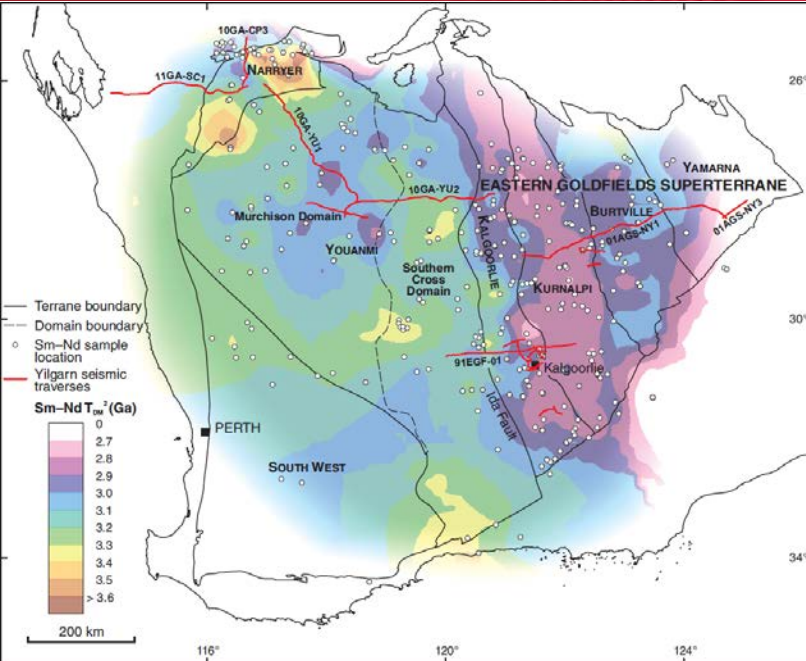
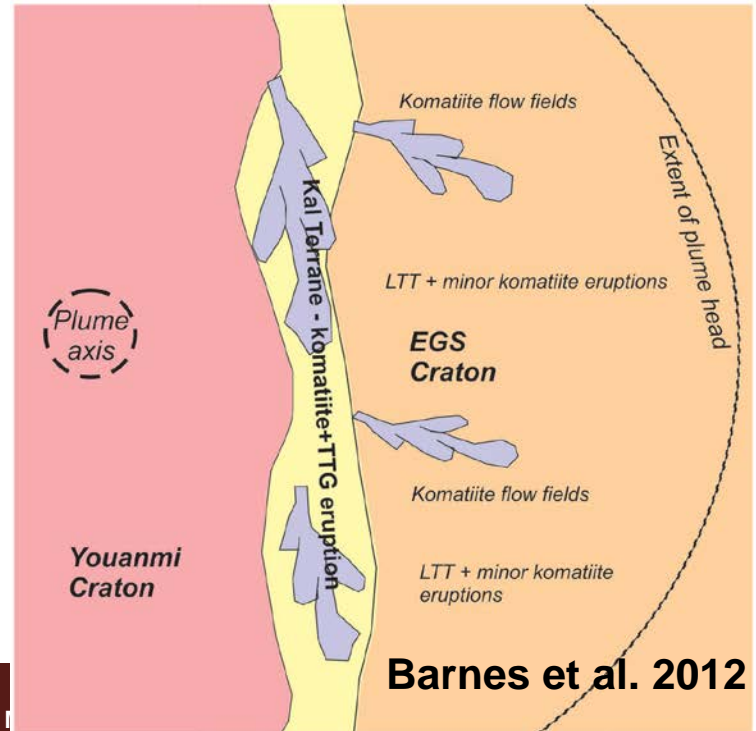
(b) Plume head impinges on base of lithosphere



(c) Plume tail flows to high point at craton margin, low-pressure melting produces voluminous komatiite



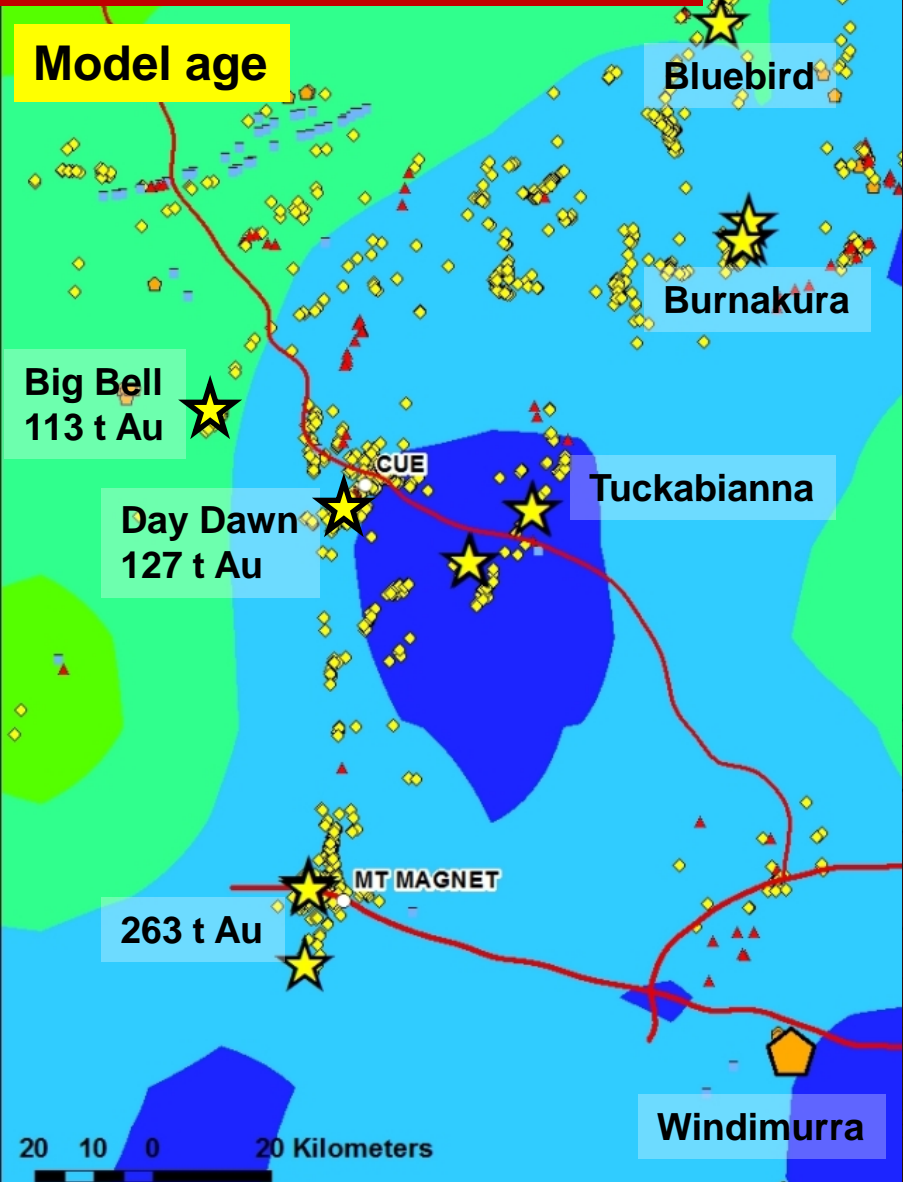
(d) Plan view - main flux of komatiite along craton margin (Kalgoorlie Terrane) - eruption of LTT basalt and less voluminous komatiite from plume head further east



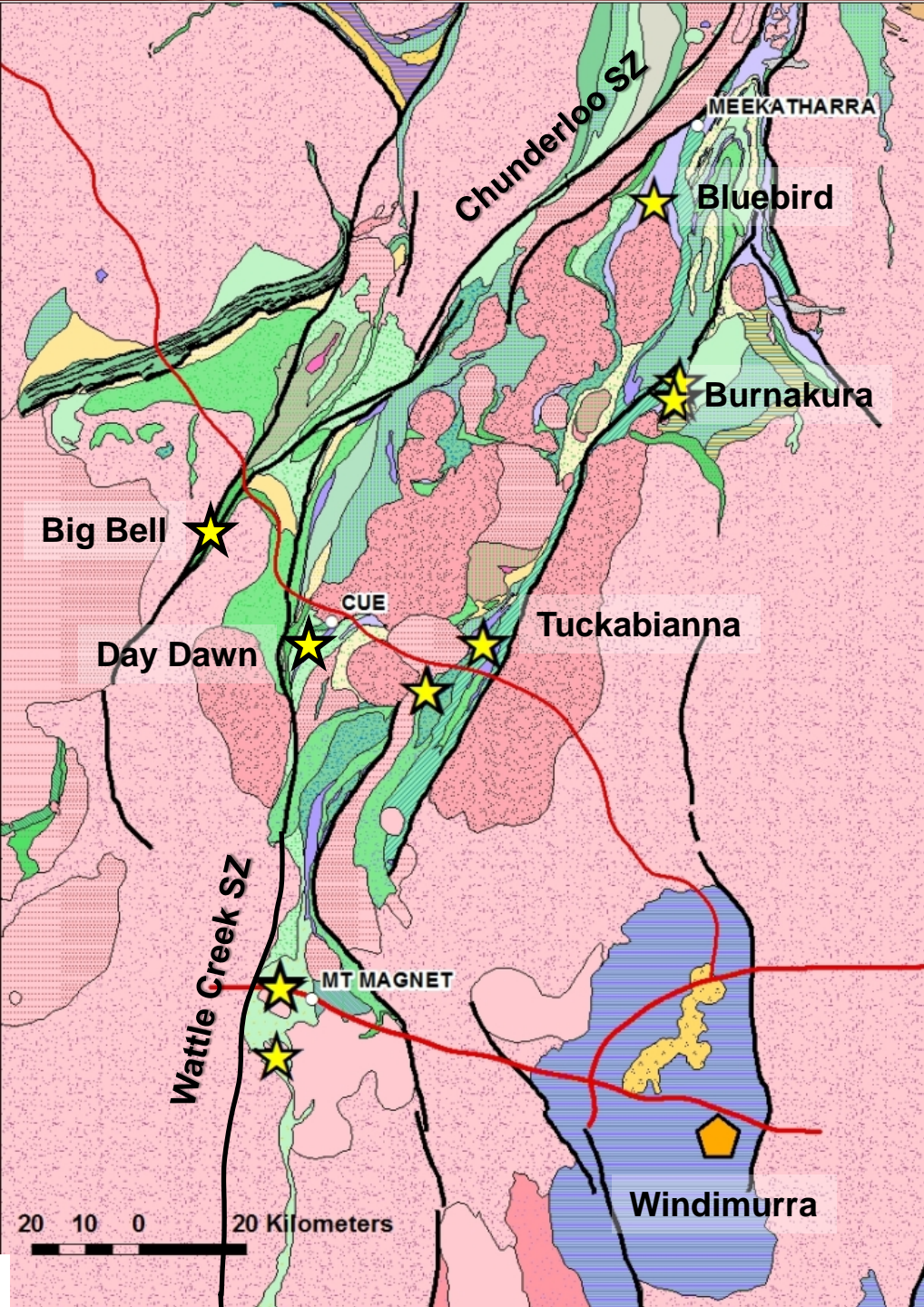
Begg et al. 2010

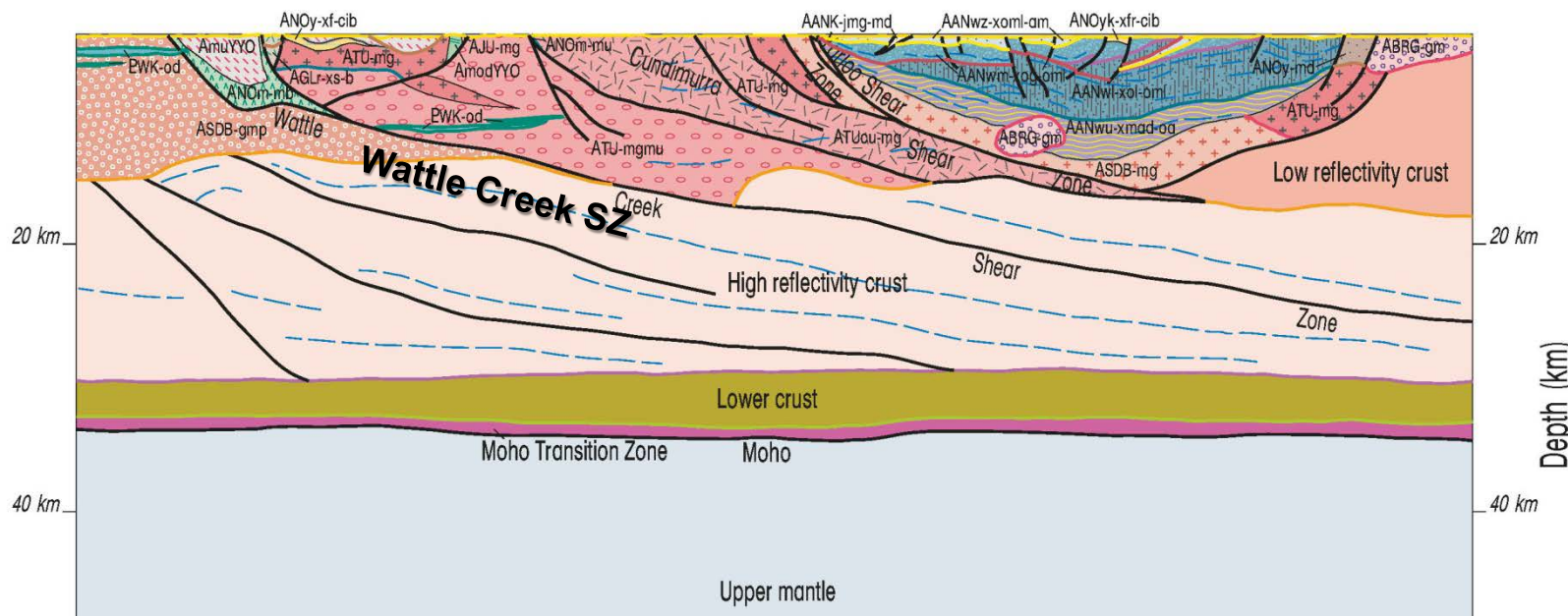
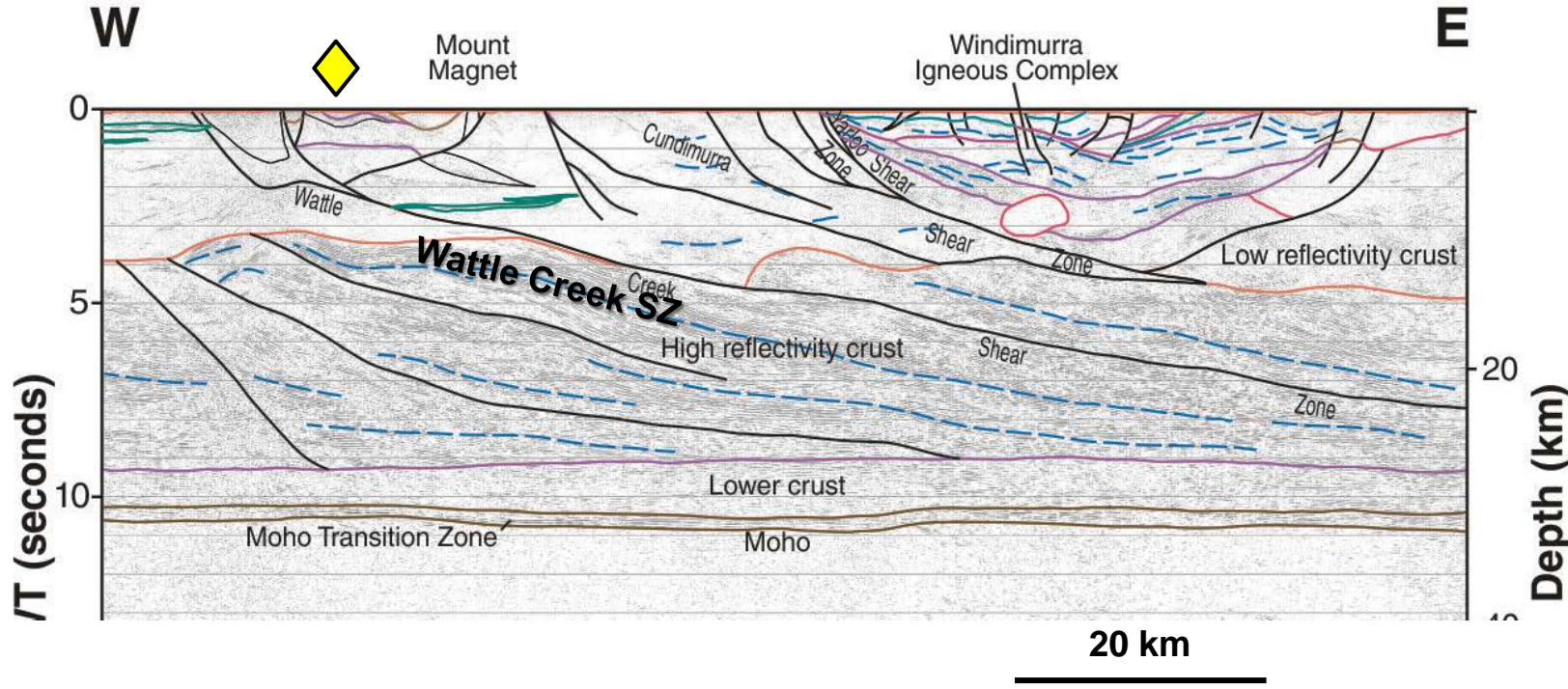
Barnes et al. 2012

Mt Magnet – Cue corridor

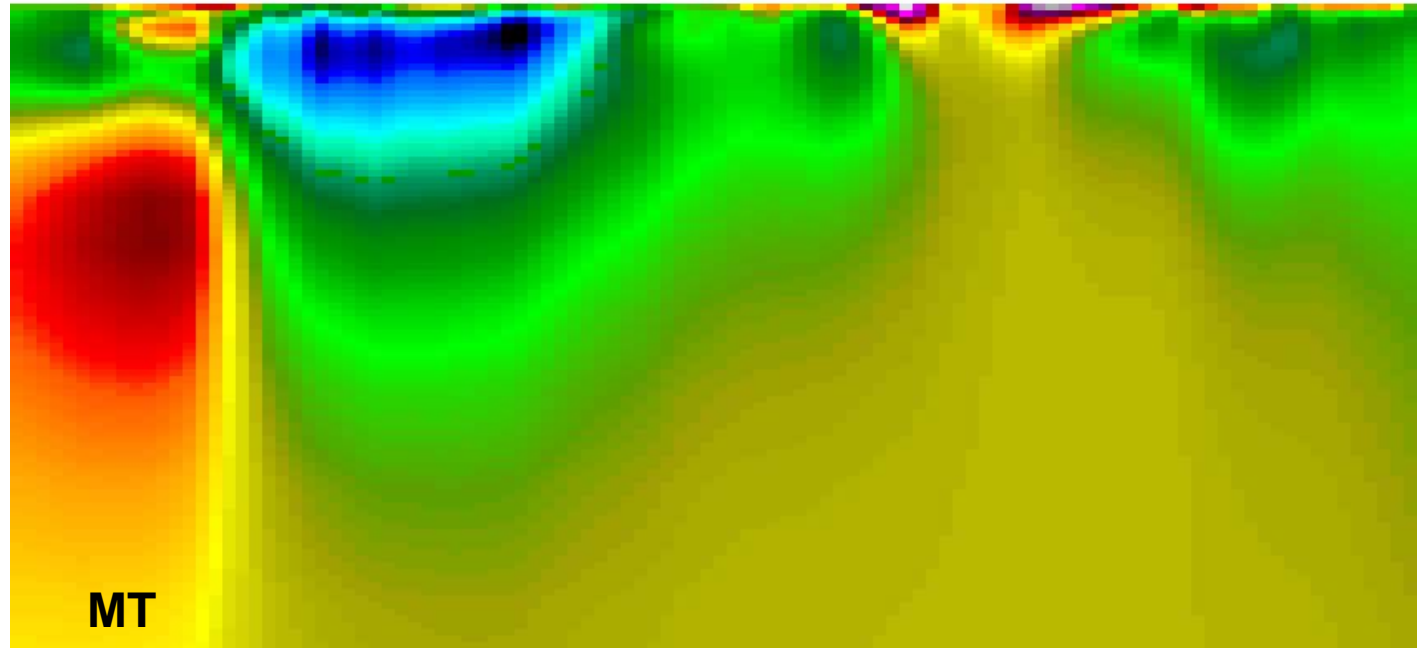
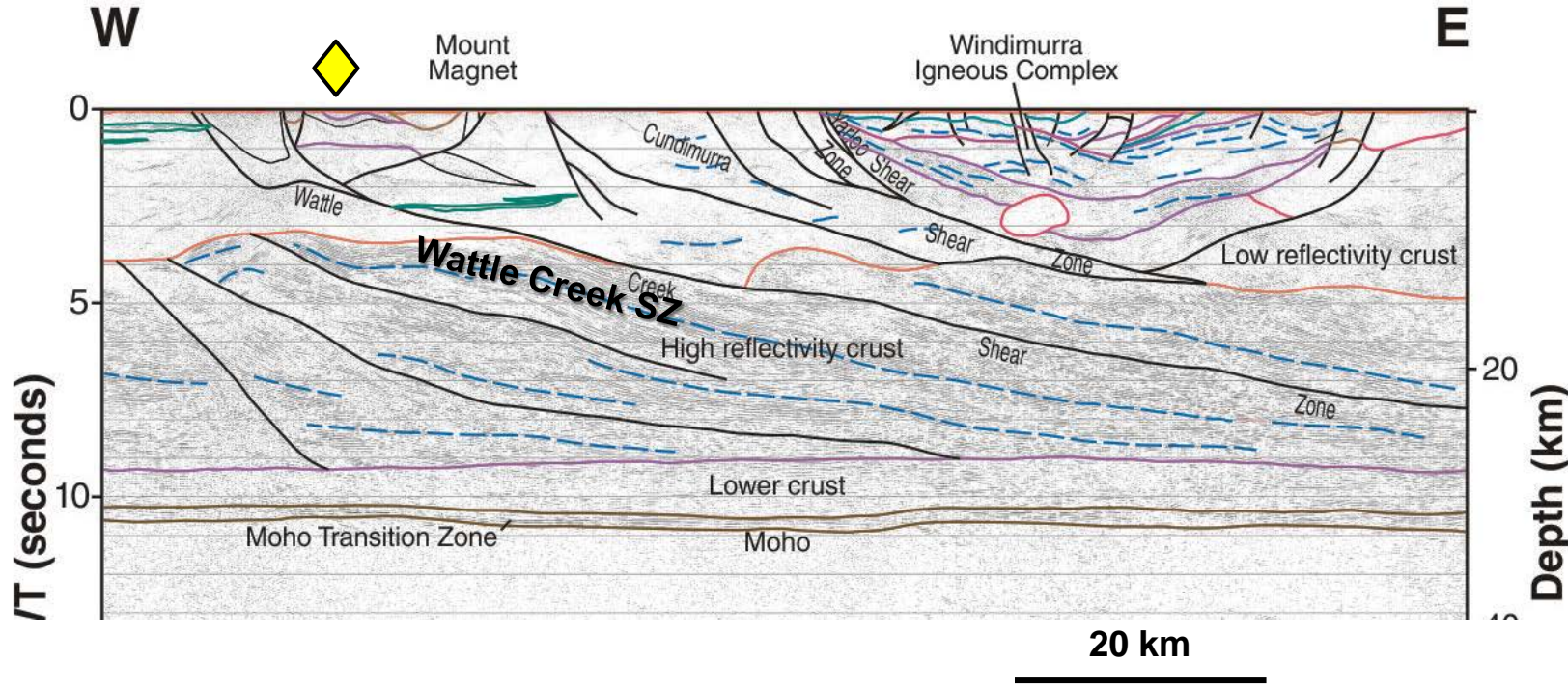


Au endowment from Robert et al. 2005

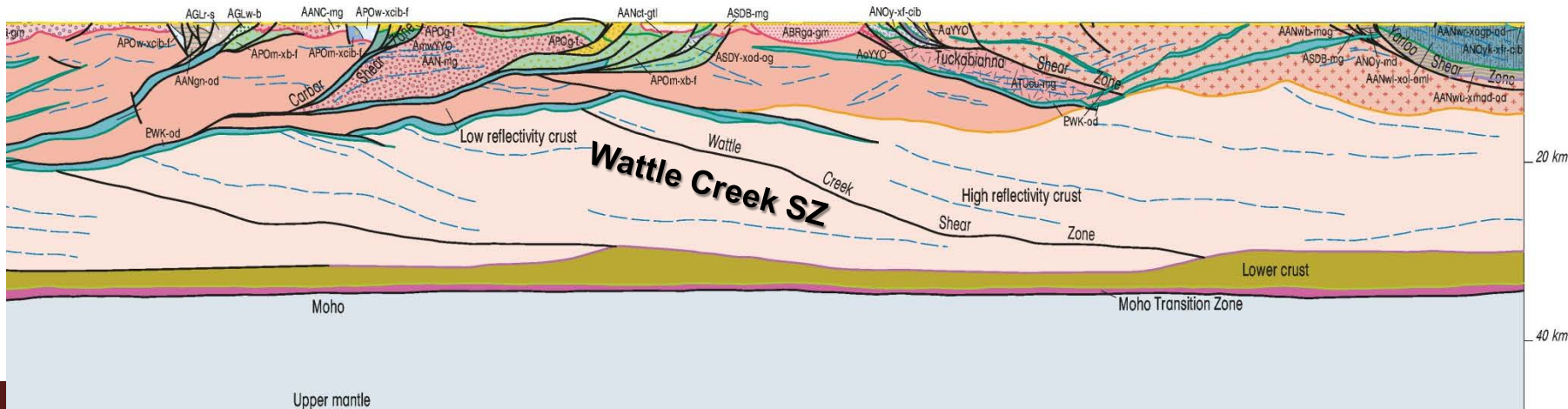
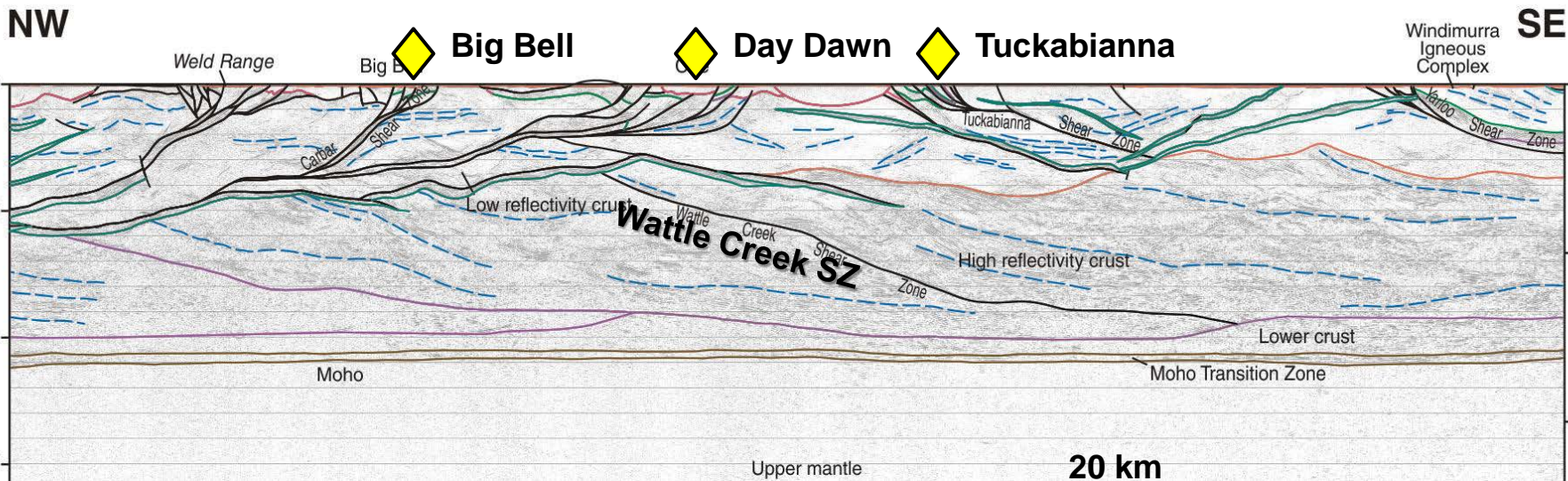




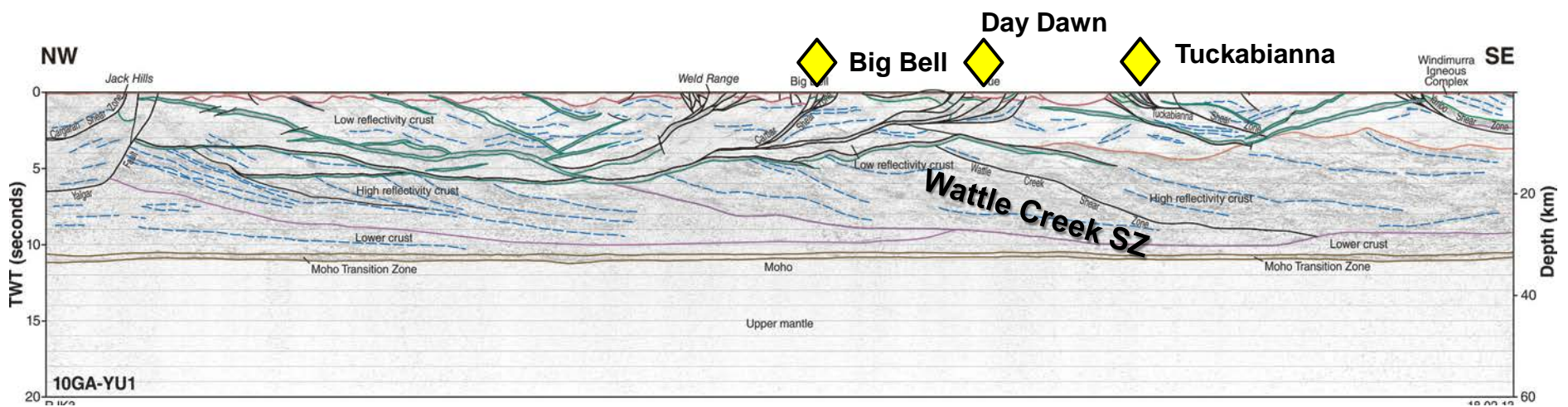
YU3



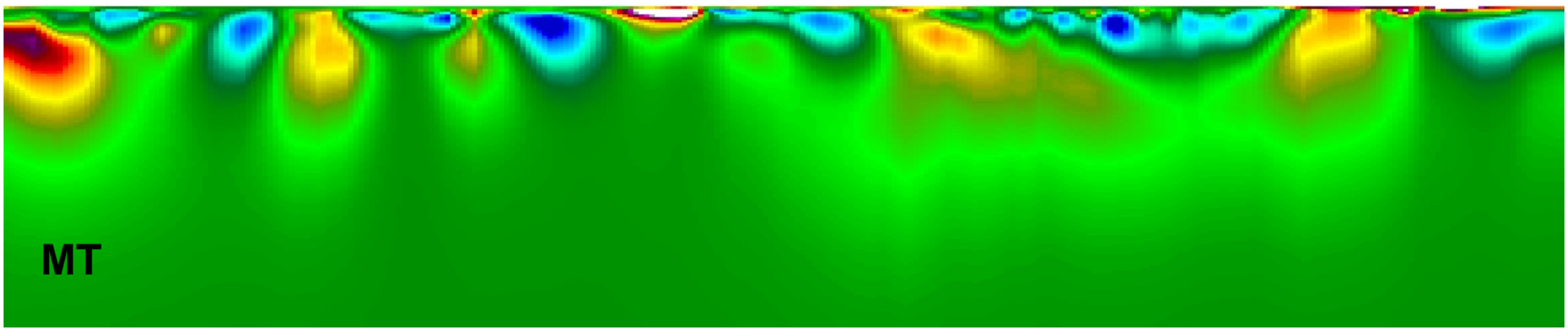
YU1



YU1

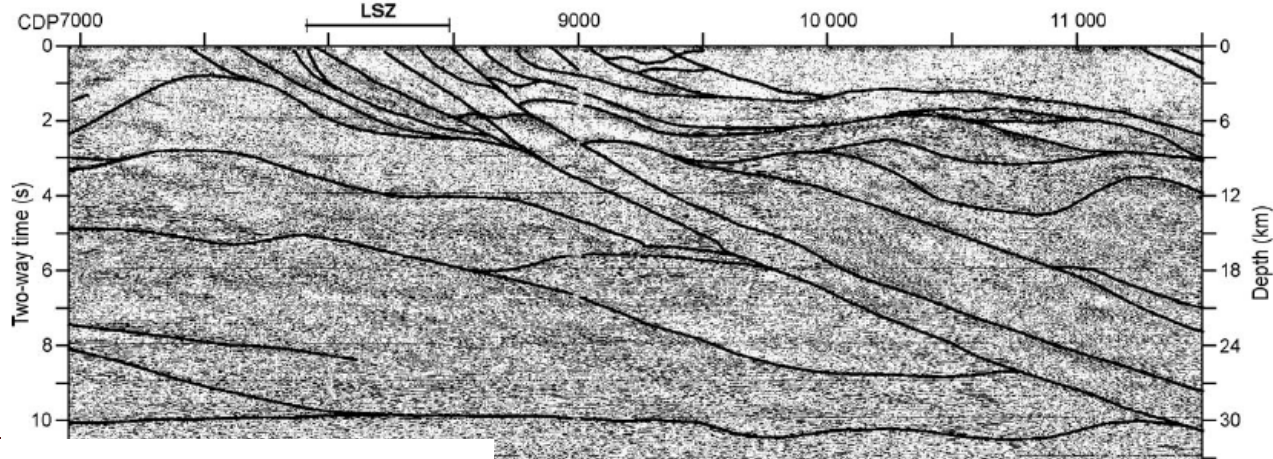
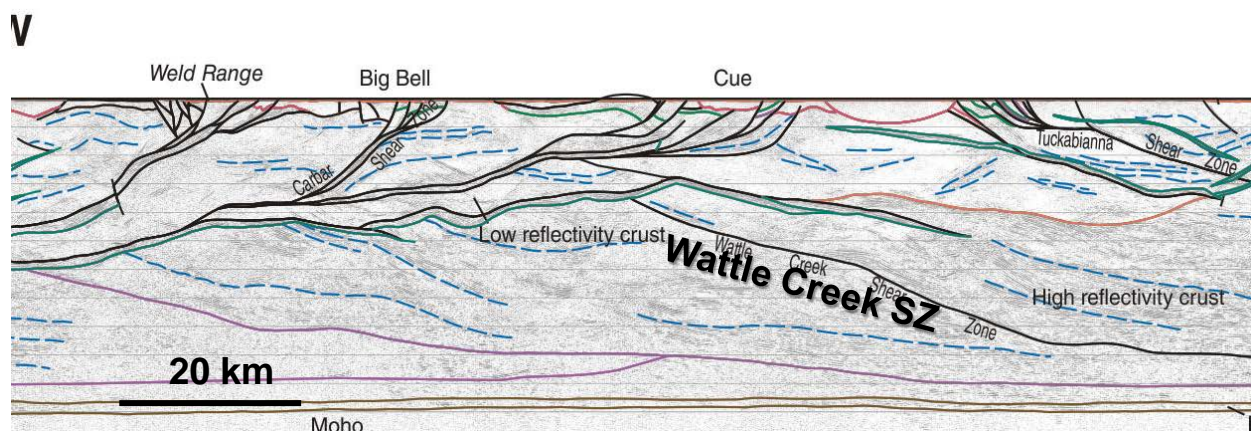
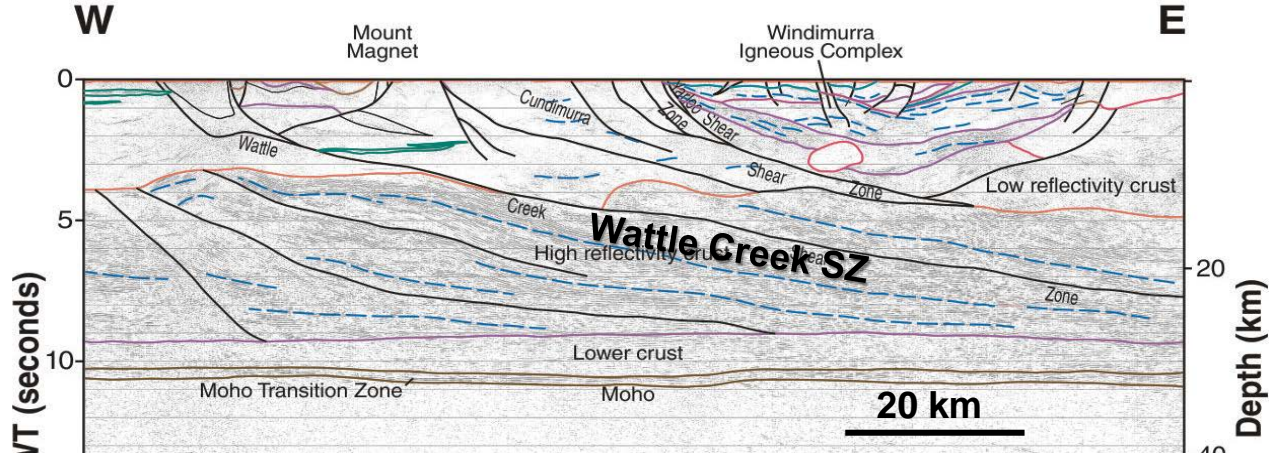


20 km



Deeply penetrating shear zones

West-dipping structural overprint in the Murchison

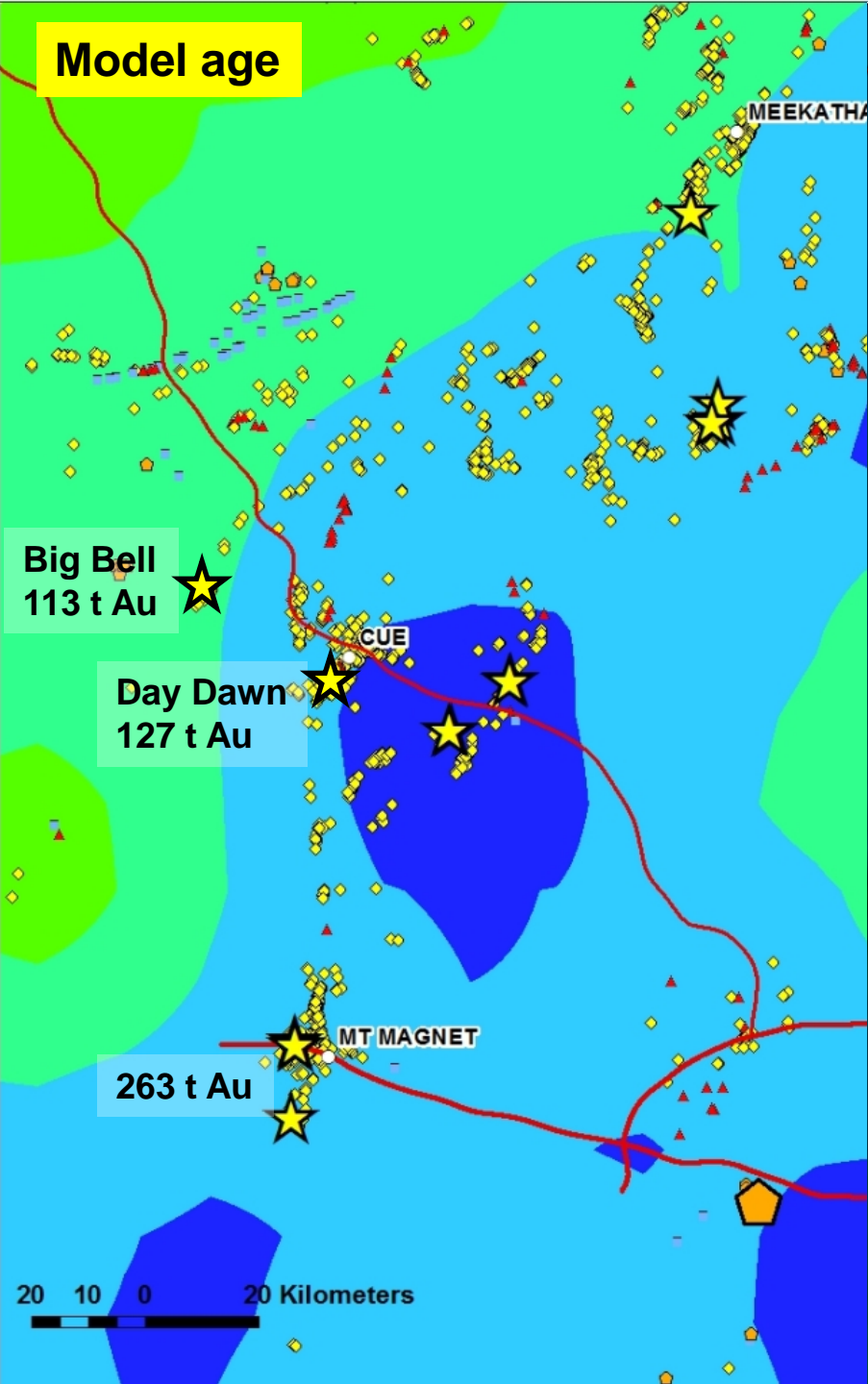


Laverton Shear Zone

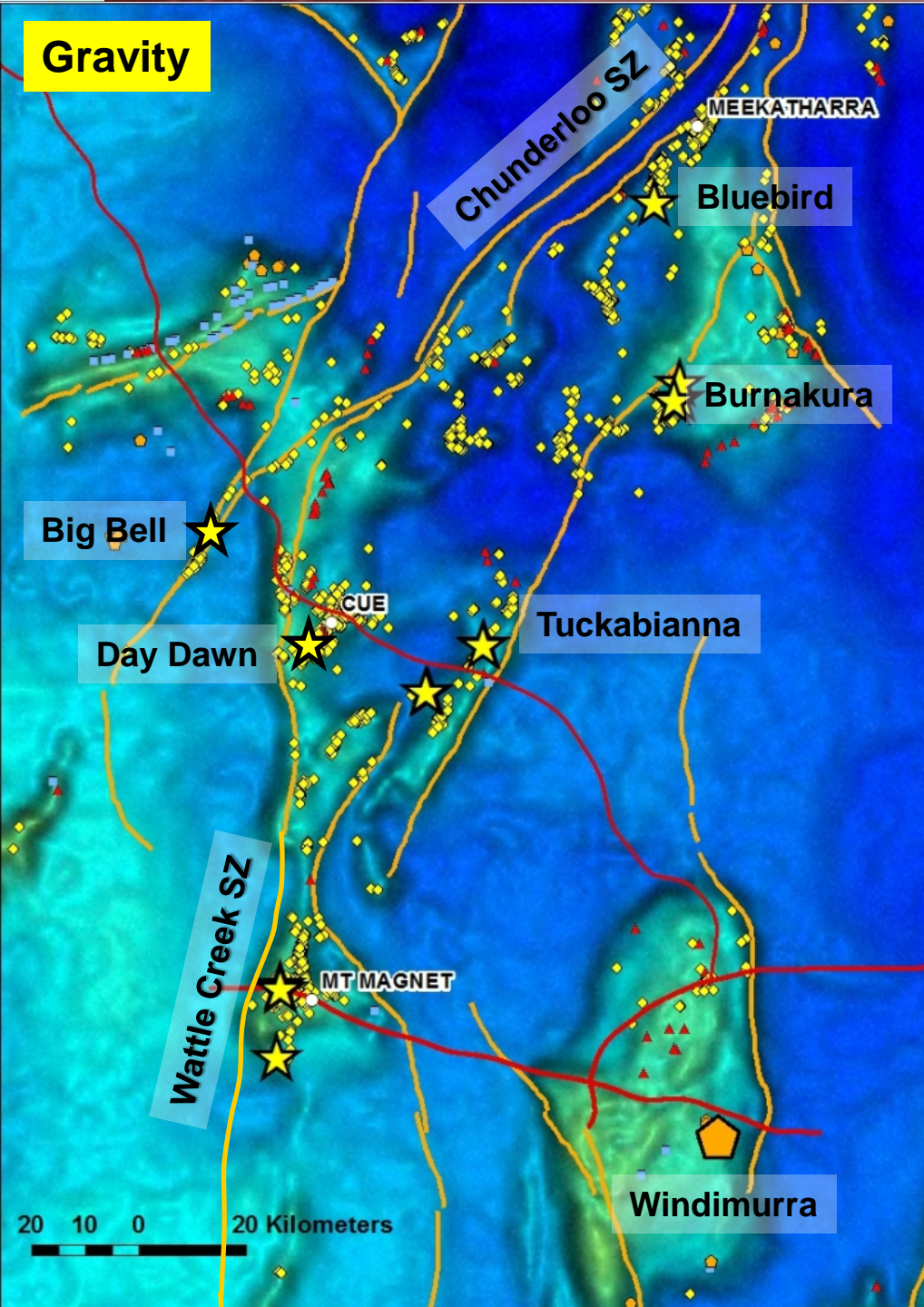
0 20 km 20 km

Goleby et al. 2004

Model age

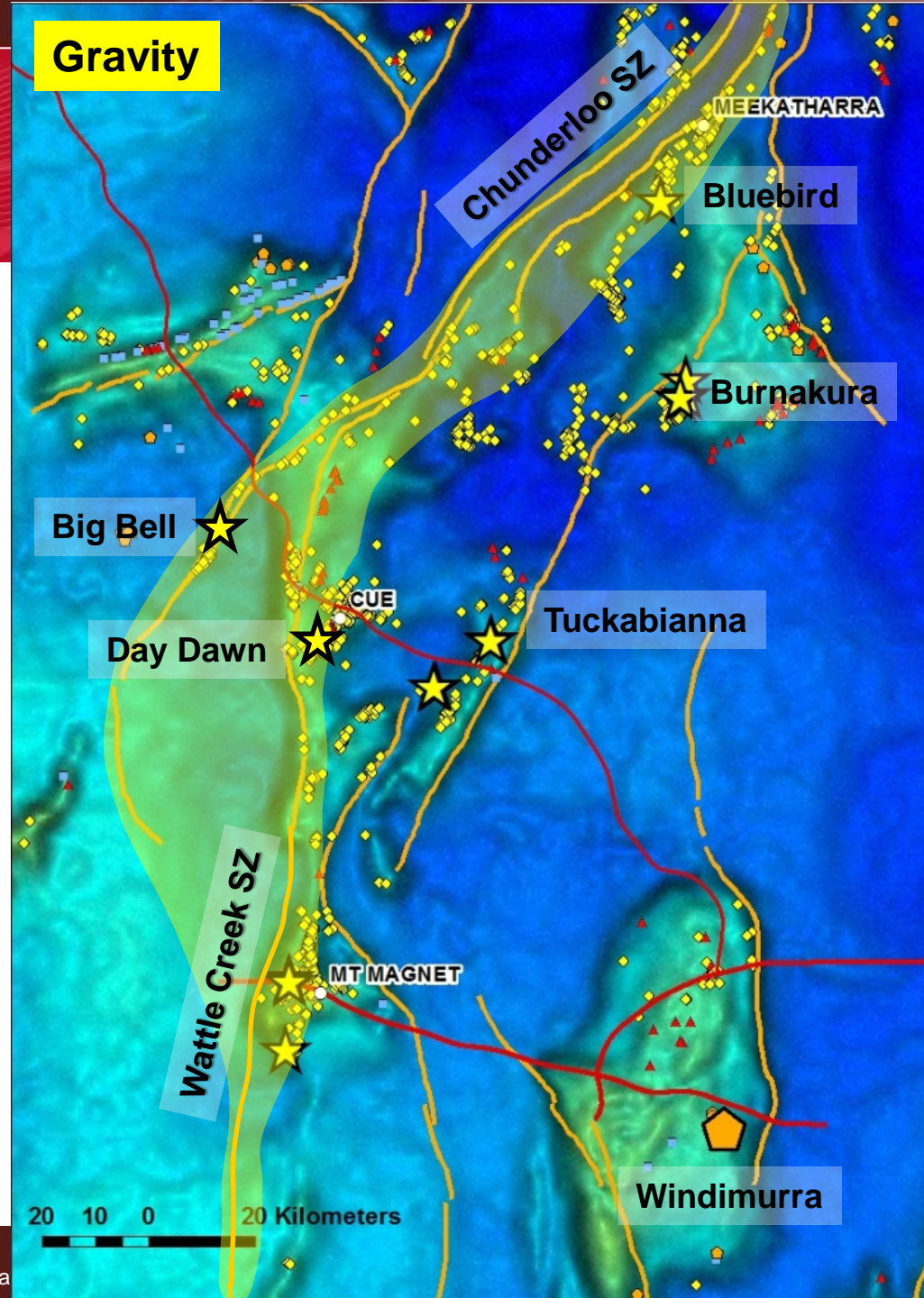


Gravity



N Murchison prospectivity

Largest gold deposits
associated with deep
structures on west
side of 'juvenile' zone

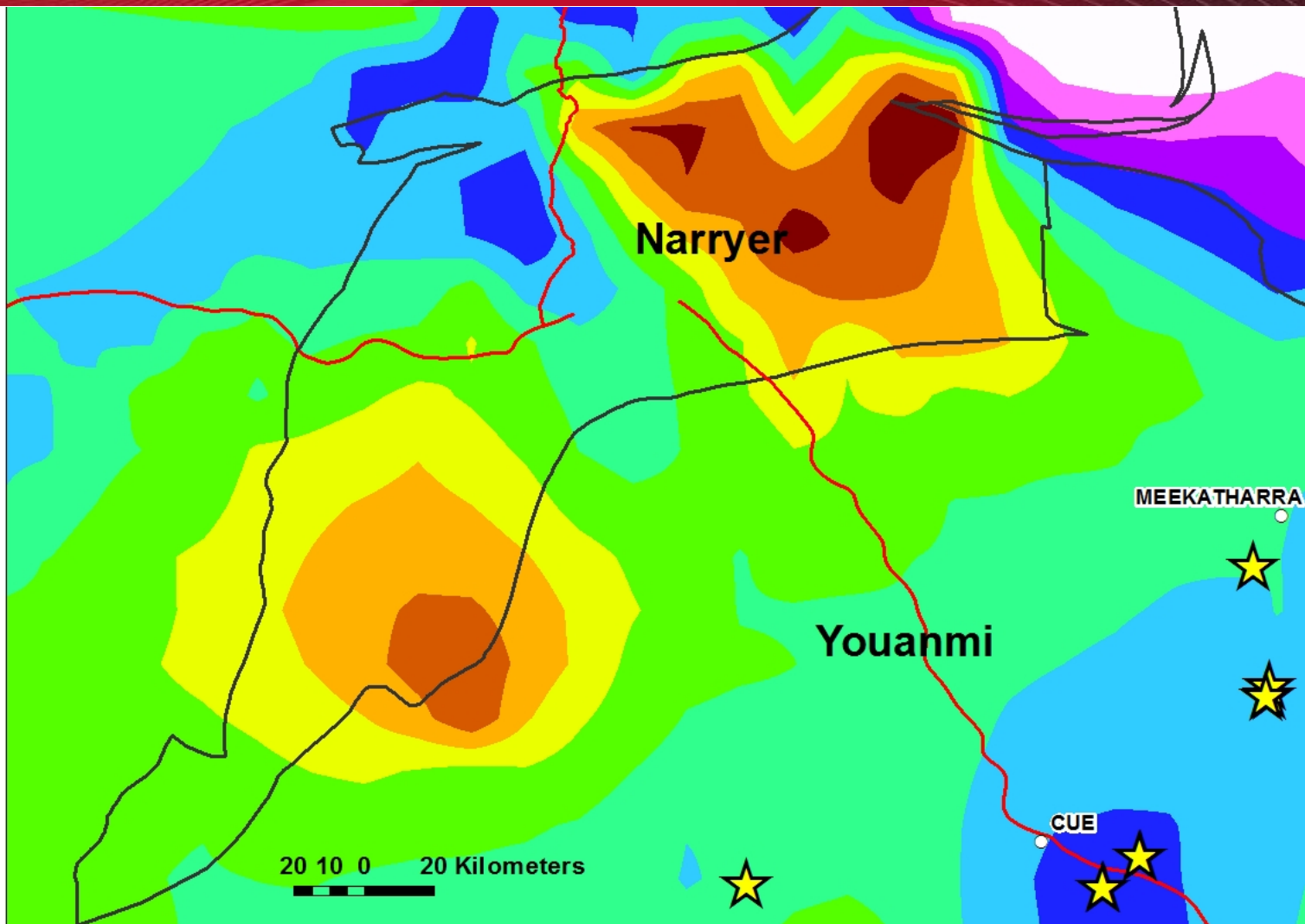


Narryer



Old, reworked
crust

Proterozoic
overprint



Summary



- Eastern end
 - Deep structures, domes, juvenile crust
 - Well endowed; good potential
- N Southern Cross
 - Deep structures in old, reworked crust
 - Less promising
- N Murchison
 - Deep structures, complex structural overprint, juvenile crust
 - Well endowed, good potential



Mount Magnet: Hill 50