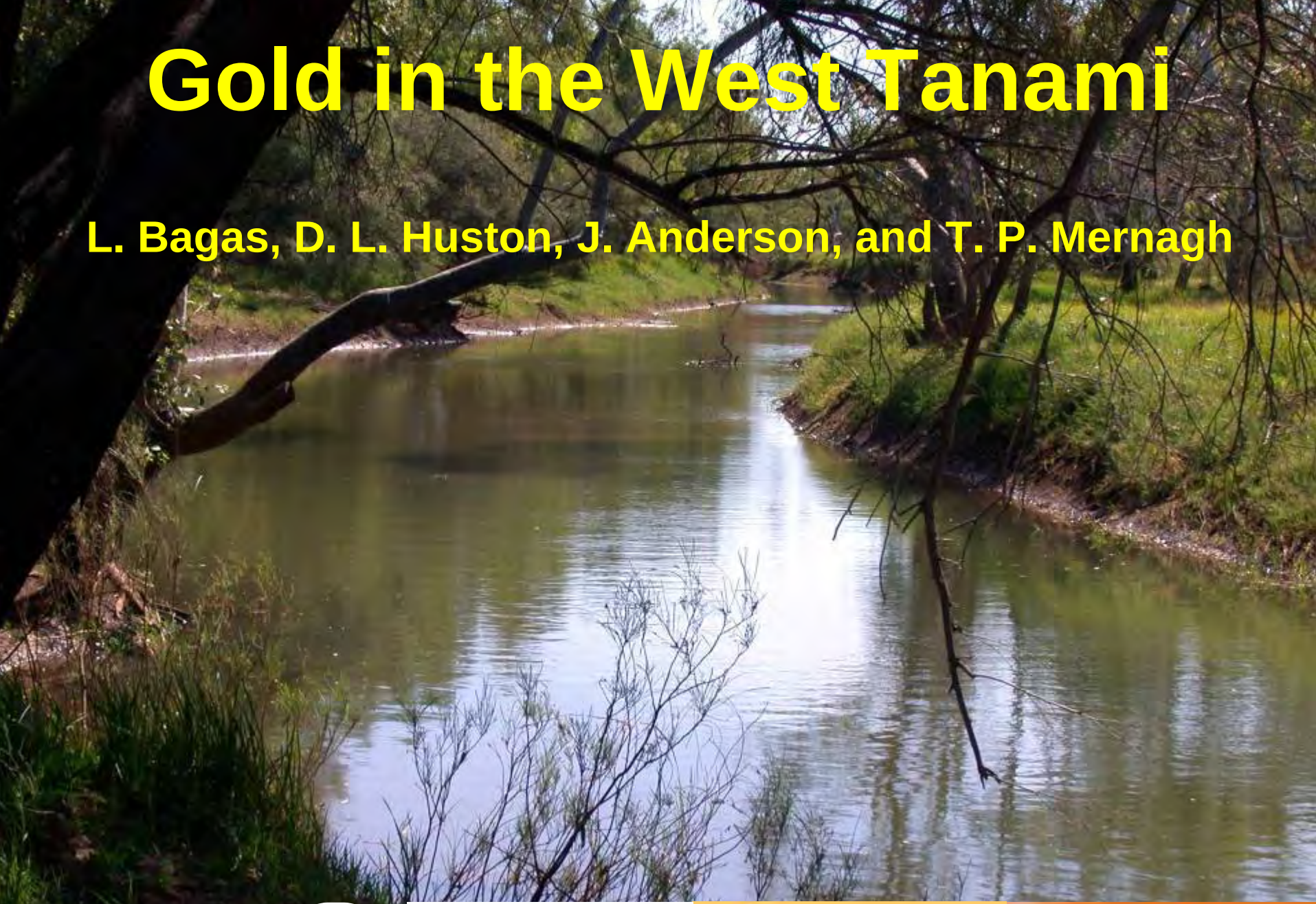
Gold in the West Tanami

L. Bagas, D. L. Huston, J. Anderson, and T. P. Mernagh



Geological Survey of Western Australia

Centre for EXPLORATION TARGETING

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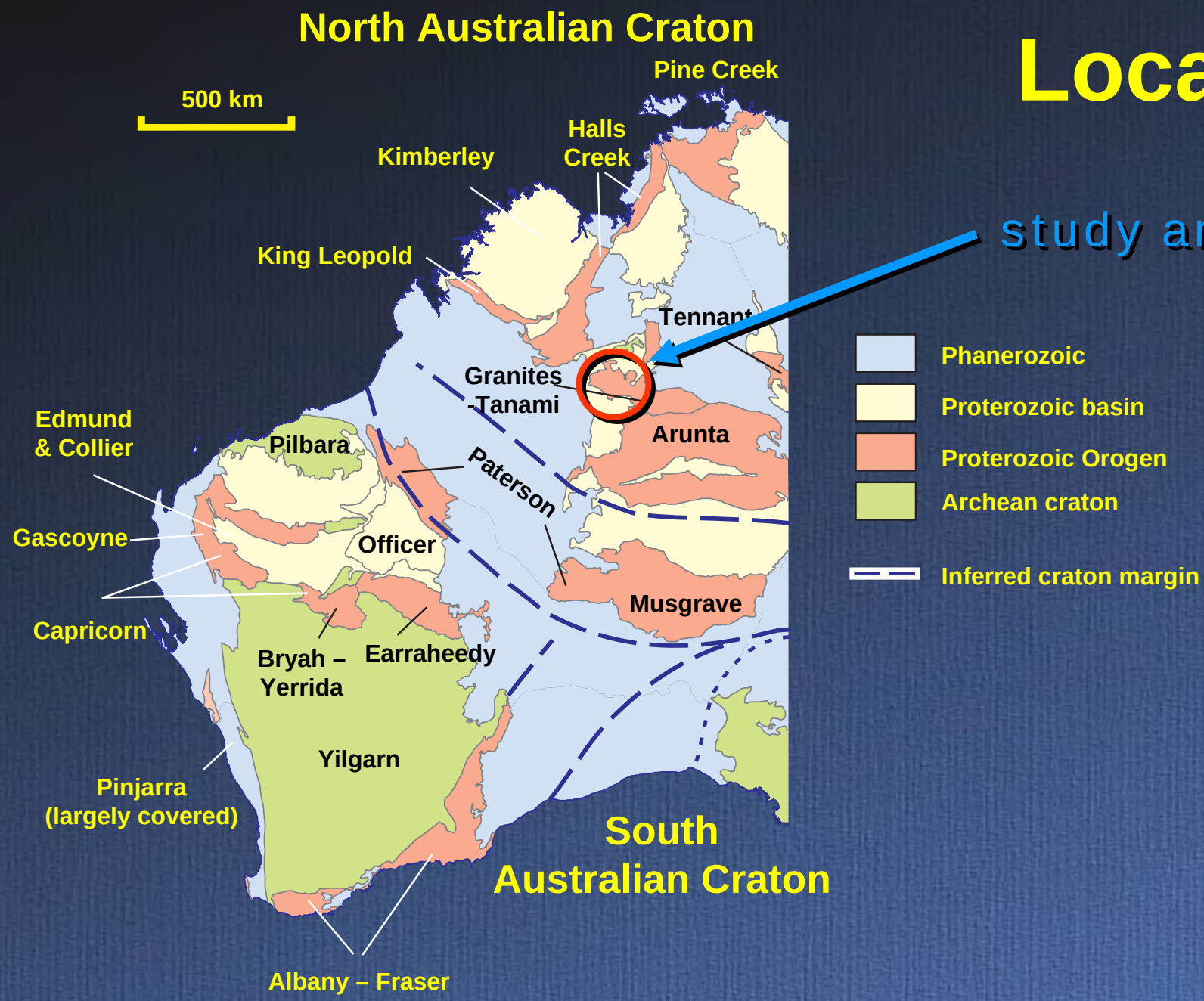
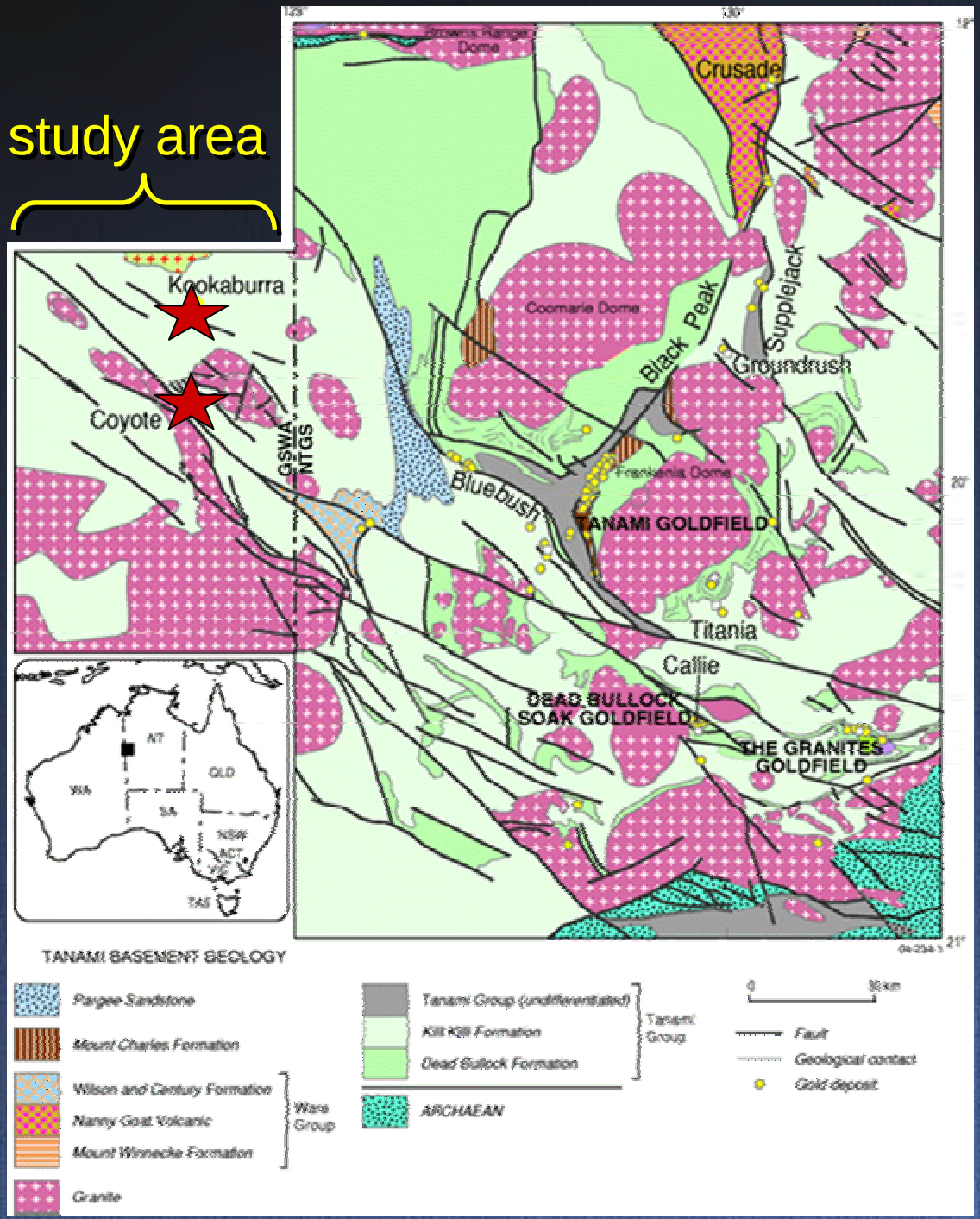
TANAMI GOLD NL

Location


North Australian Craton
500 km
Pine Creek
Halls Creek
Kimberley
King Leopold
Tennant
Granites -Tanami
Arunta
Edmund & Collier
Pilbara
Paterson
Gascoyne
Officer
Musgrave
Capricorn
Bryah – Yerrida
Earraheedy
Yilgarn
Pinjarra (largely covered)
South Australian Craton
Albany – Fraser
study area
Phanerozoic
Proterozoic basin
Proterozoic Orogen
Archean craton
Inferred craton margin

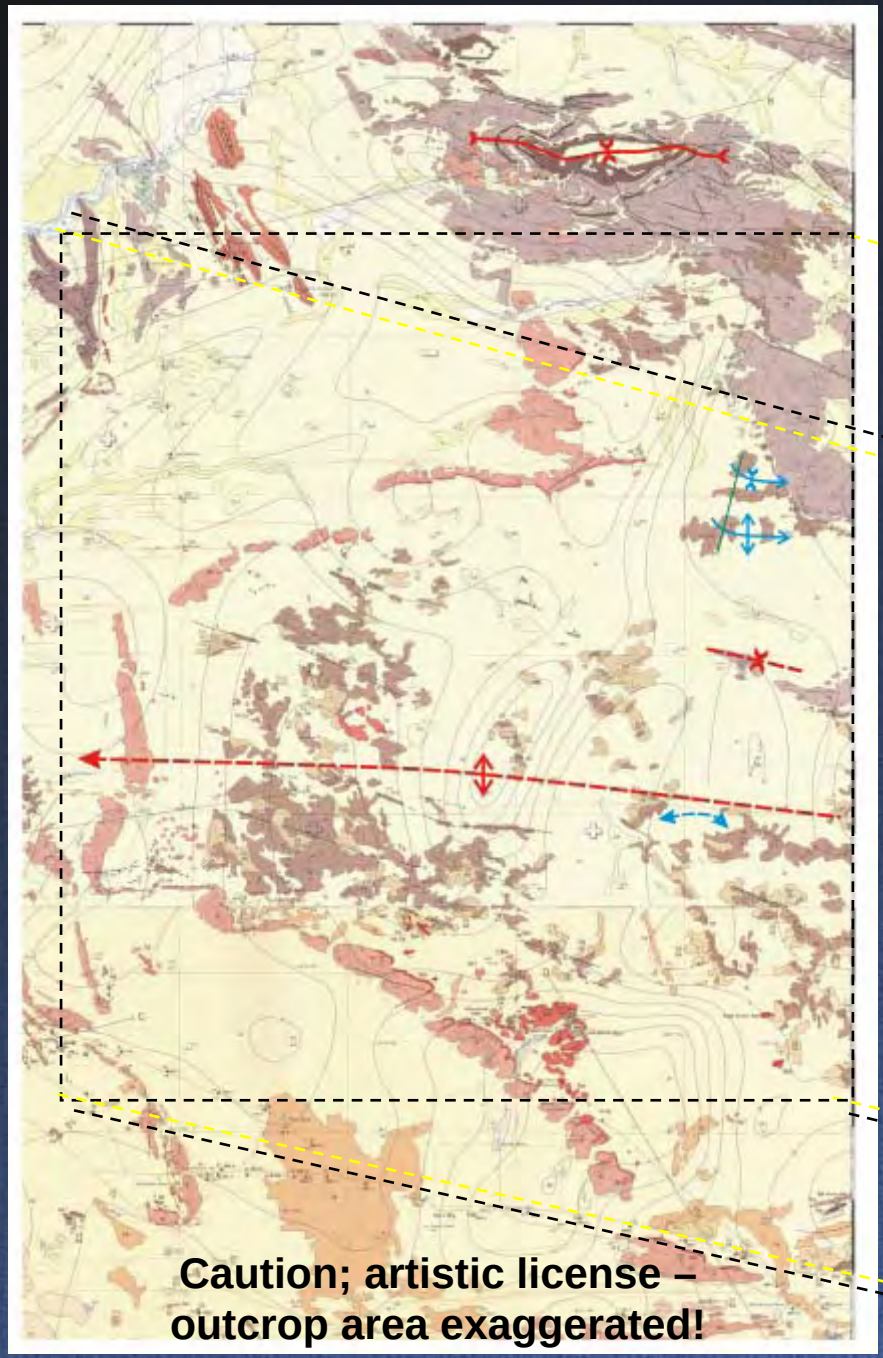


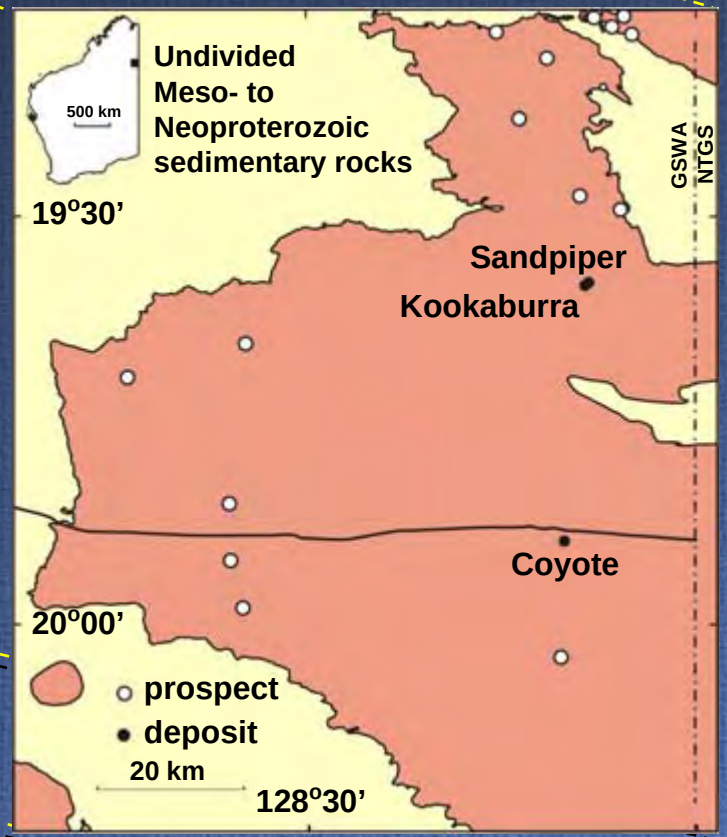
Tanami region

>280 T Au

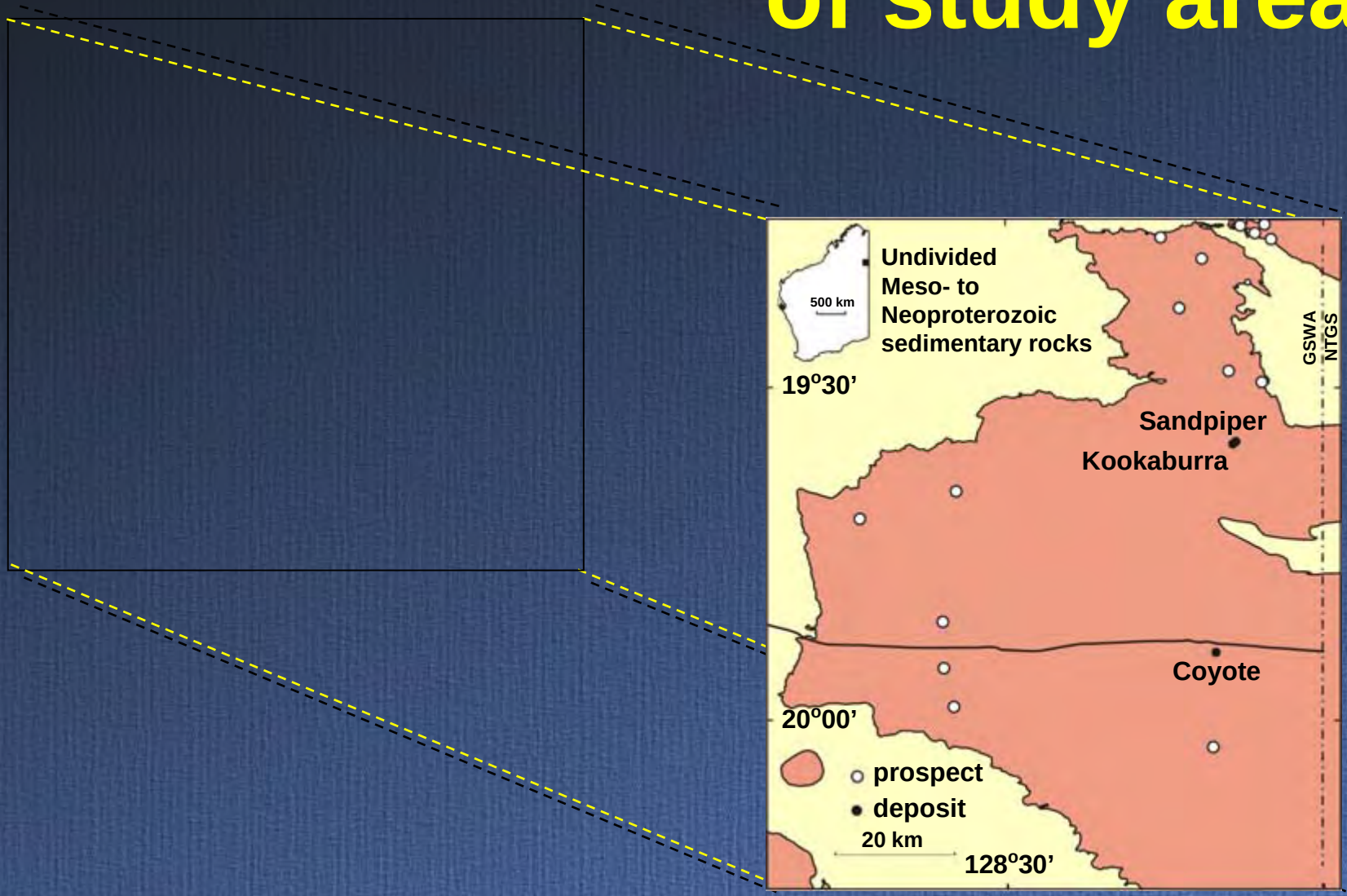
interpreted (by some) as 'thermal aureole Au' (e.g. Wall and Taylor, 1990)

Local geology

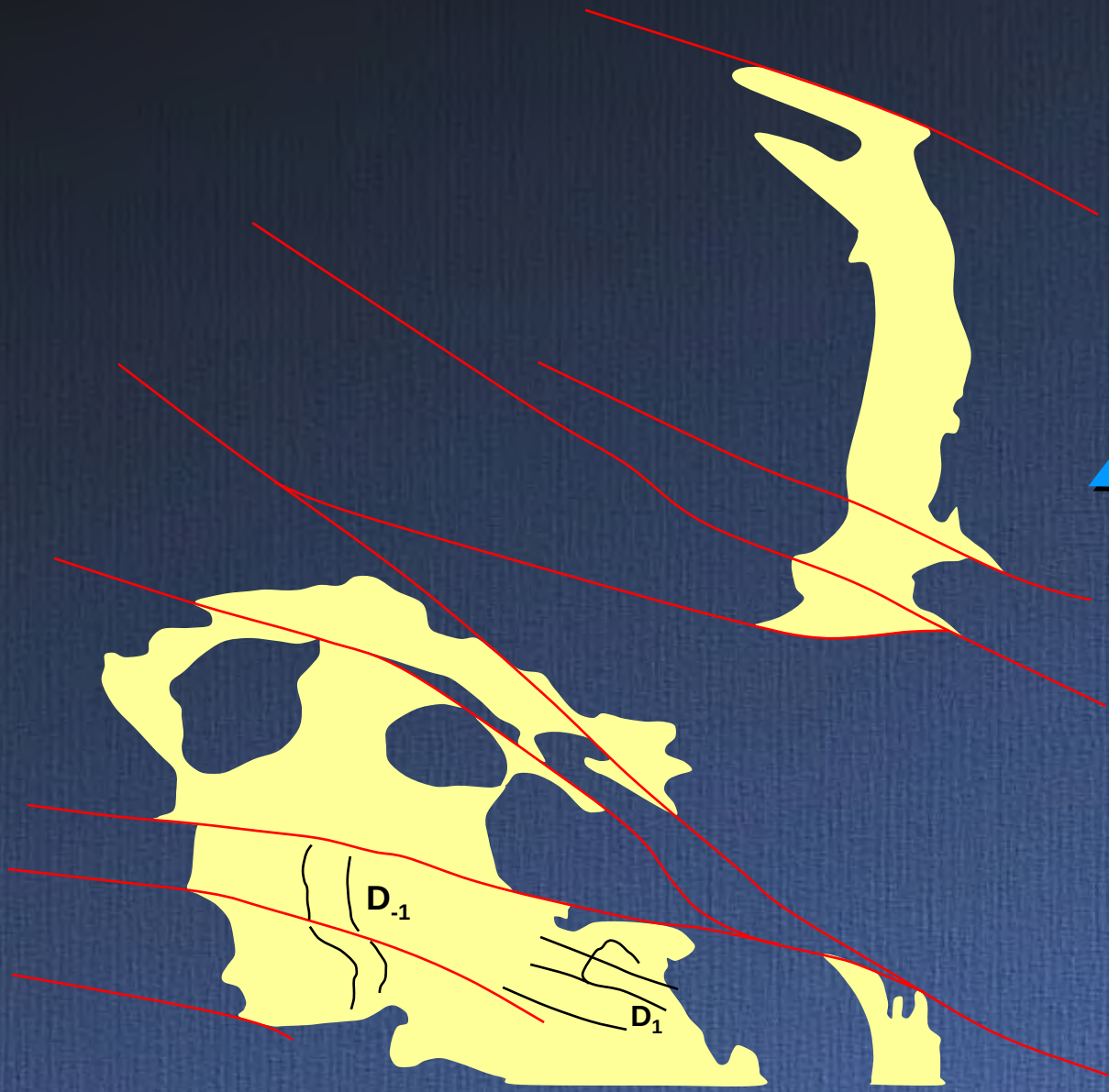




Regional mag. of study area



Detailed TMI



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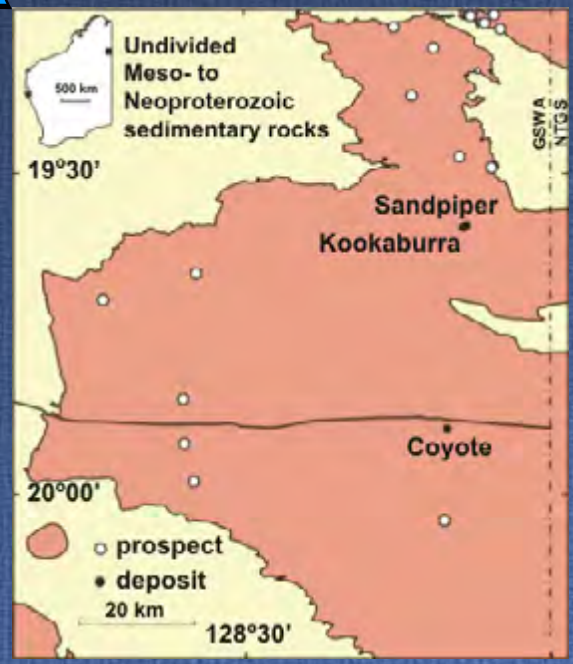


Zoom in

1st VD

Local geology

Granite (c. 1800 Ma)

Killi Killi Fm (2); shale, ferruginized shale, chert, metawacke (Dead Bullock Fm (2))

F

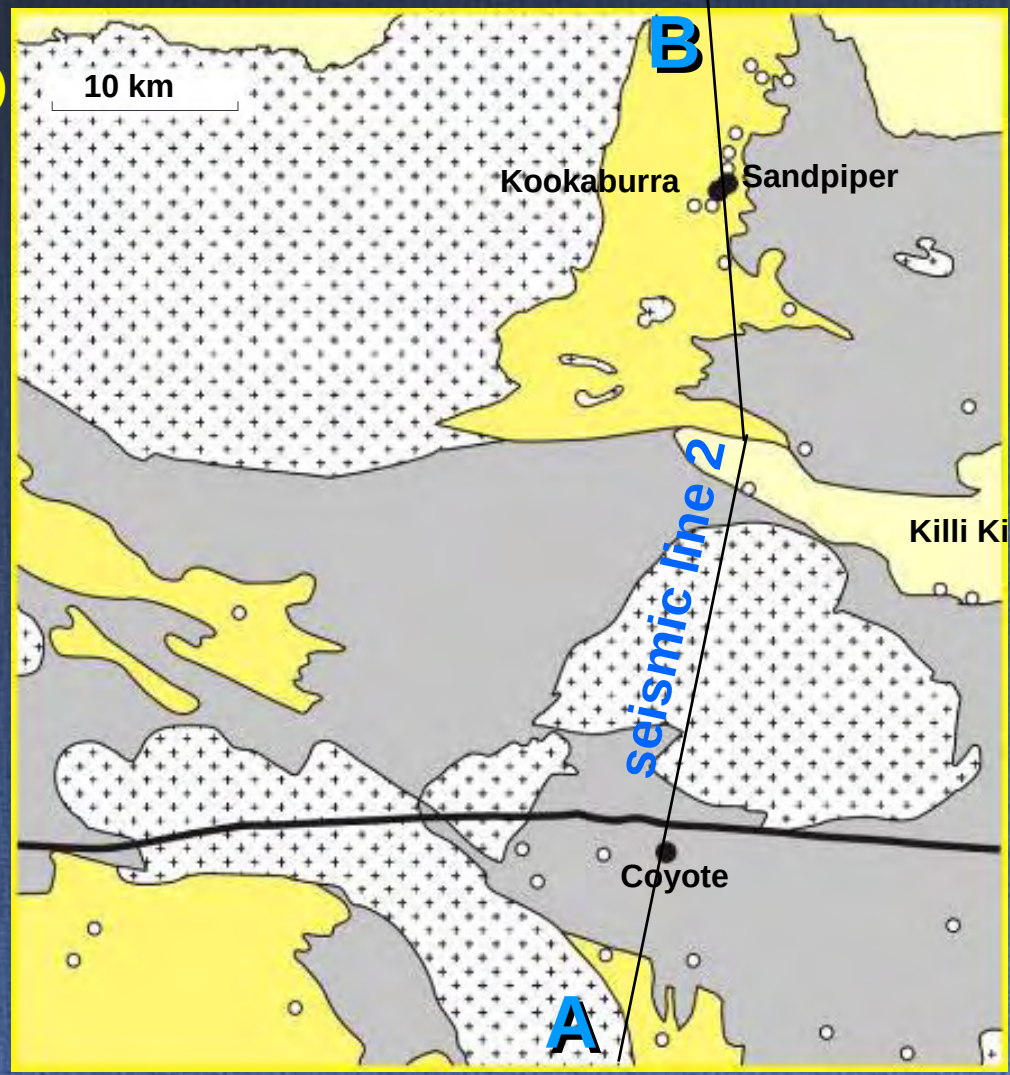
Metawacke, pelite, mafic sills, and rare metavolcanics (1864 Ma)

"Dead Bullock Fm (1)" Stubbins Fm, aka "Bald Hill sequence", aka "Dead Bullock Fm (1)…

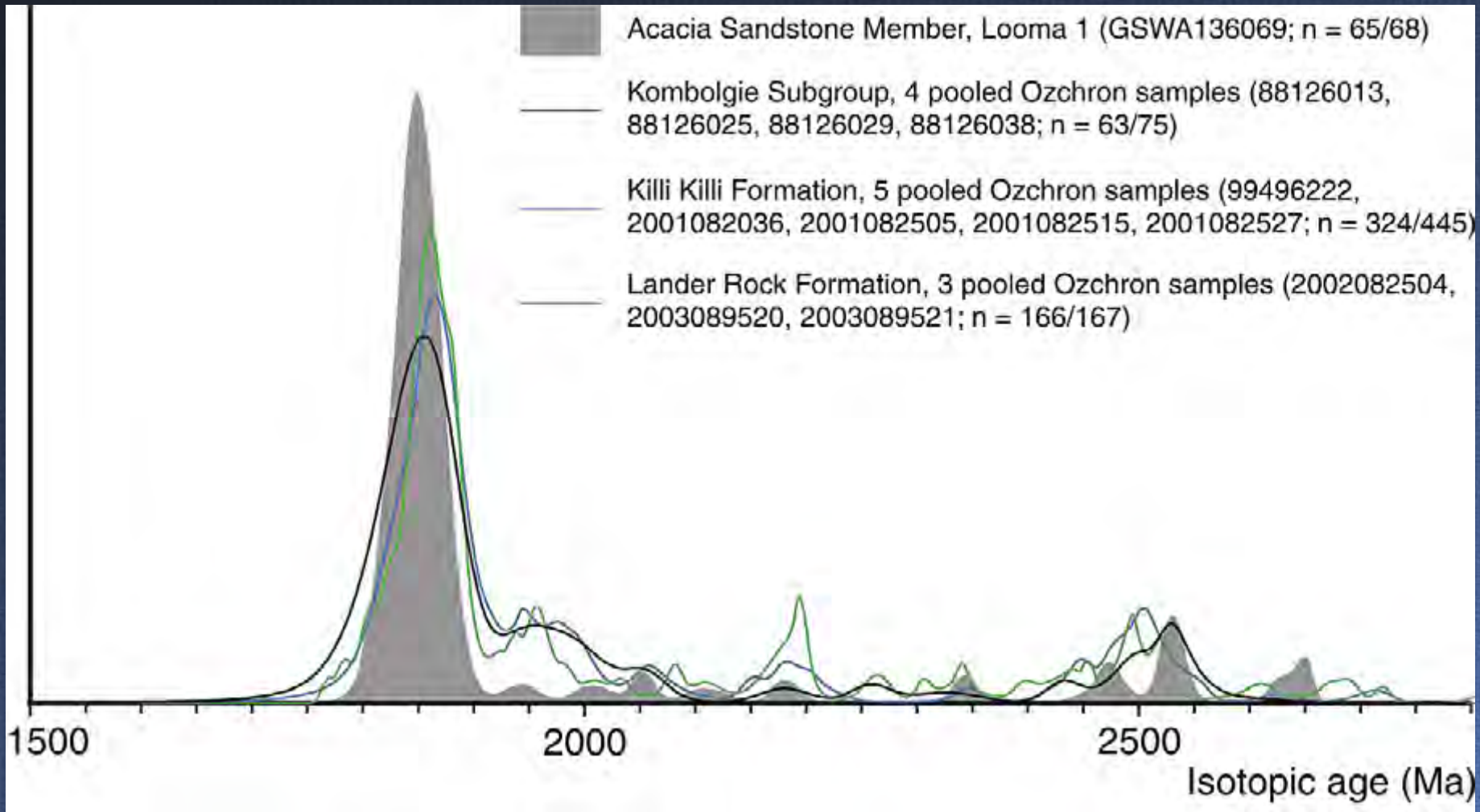
"Killi Killi Fm (1)"

Pre-F_1

Tanami Orogeny (F_1)

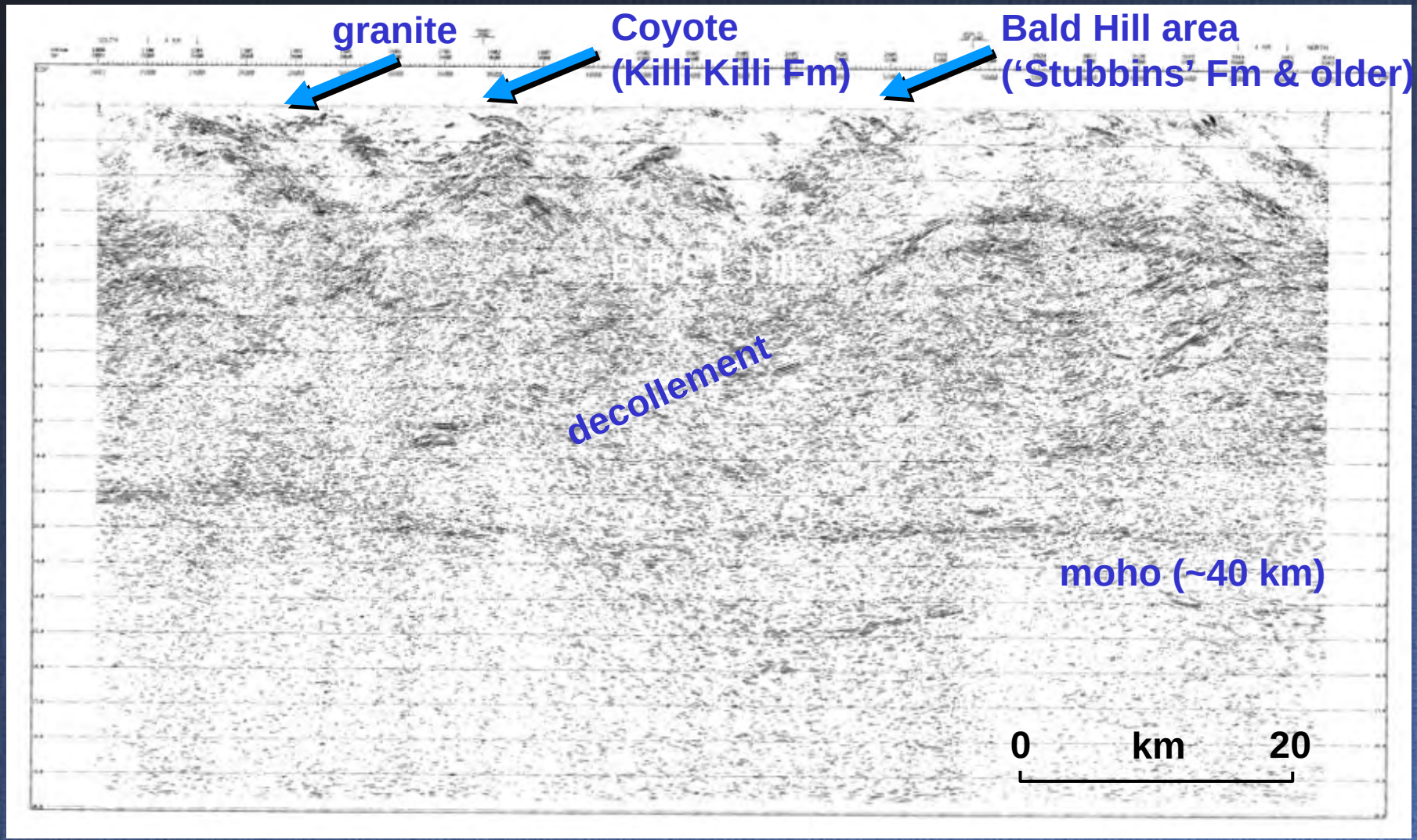


Caution

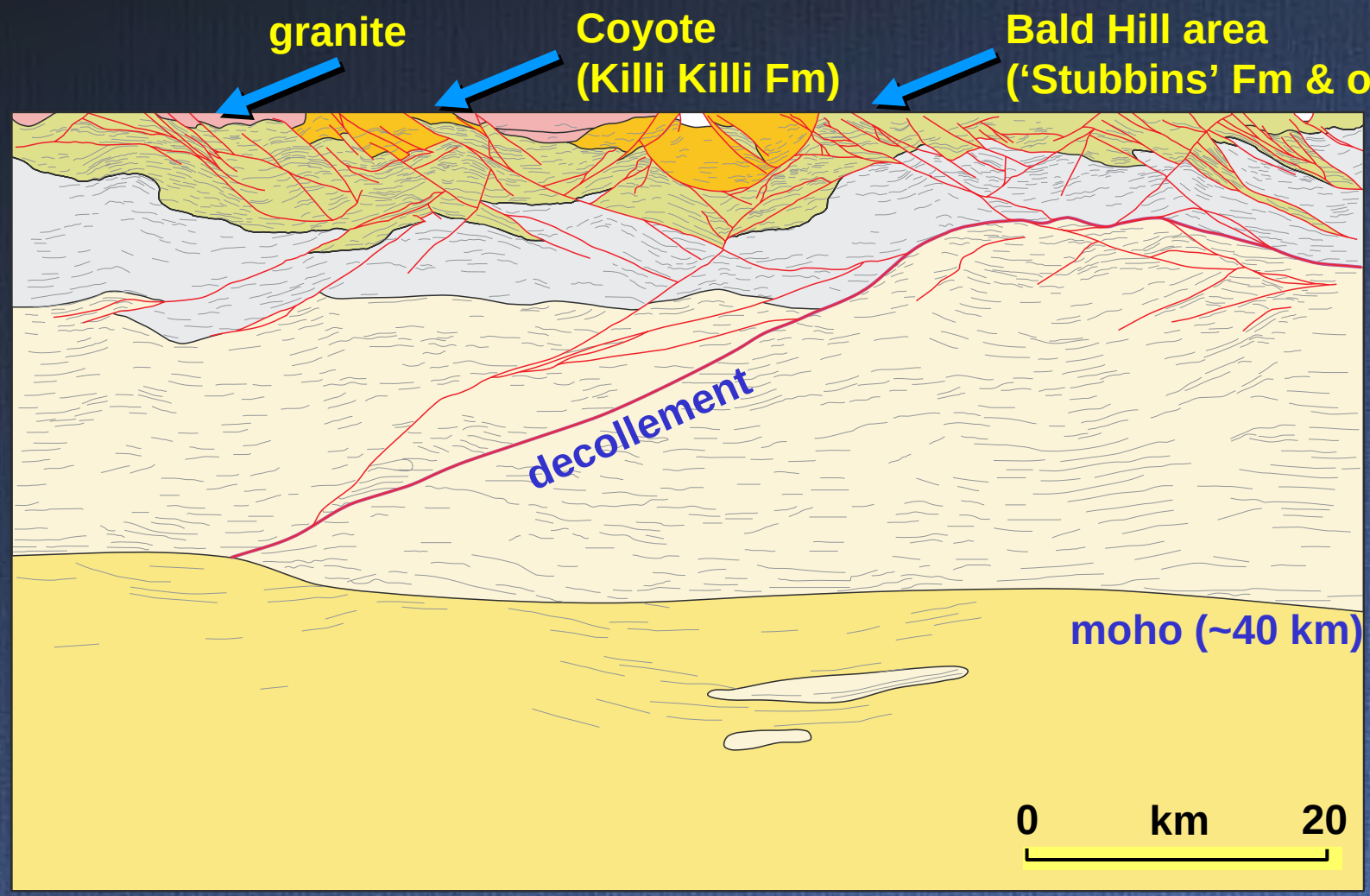


(Peter Haines, written comm., 2006)

Seismic profile Line 2



Crustal fantasy

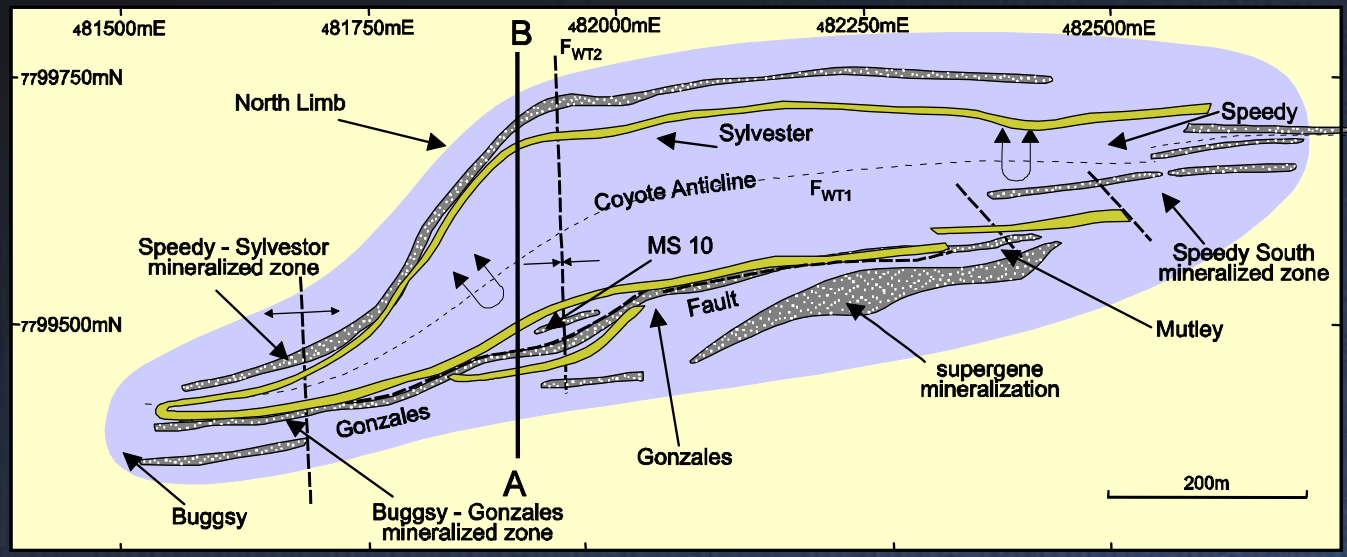


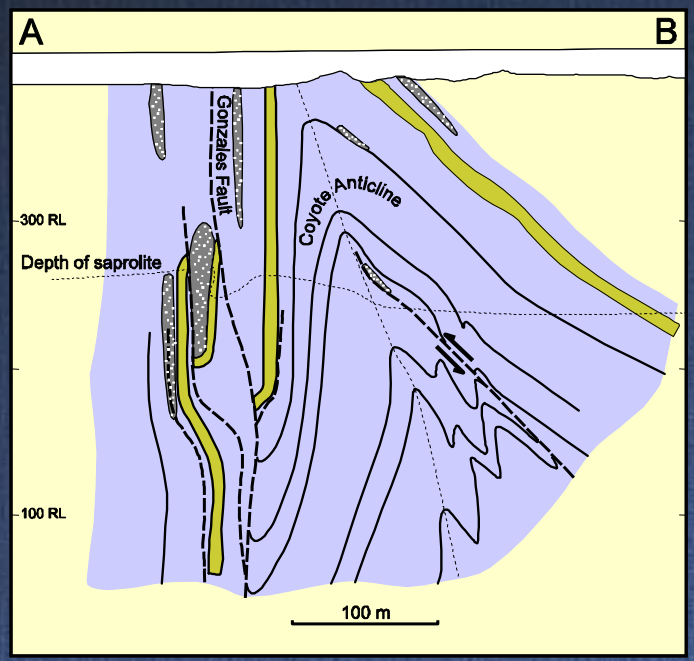
Typical Coyote ‘outcrop’

Rob for scale

Coyote geology

(regolith 'removed')





Ore lens (diagrammatic)

Fault

Overturned anticline

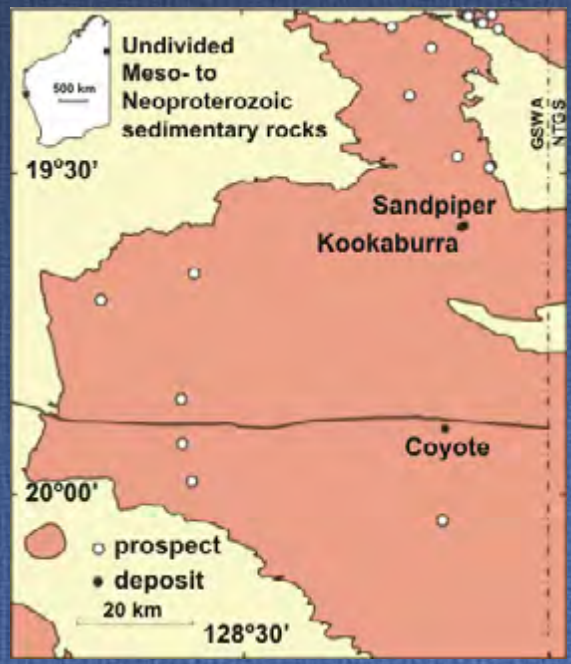
Bedding (diagrammatic)

Transported cover

Killi Killi Formation (c. 1835 Ma)

Wacke, siltstone, and shale

Siltstone, shale, and wacke



(modified after AngloGold Ashanti and Tanami Gold NL maps)

Coyote Au:

- Consists of ore lenses localized along the limbs of the Coyote Anticline
- The largest lenses are associated with the Gonzalez Fault on the steeply dipping southern limb of this fold. The fault formed after the anticline and was reactivated.
- Au was introduced at c. 1790 Ma into dilatant zones formed in perturbations along this fault during later reactivation (reg. D_5) towards the end of a period of c. 1800 Ma granite emplacement. This is supported by the 1791 ± 8 Ma age for hydrothermal xenotime at the deposit.
- Visible Au is associated with qtz-chl-py-(apy-galena-sph) veins with narrow (< 5 mm) chloritic selvages…

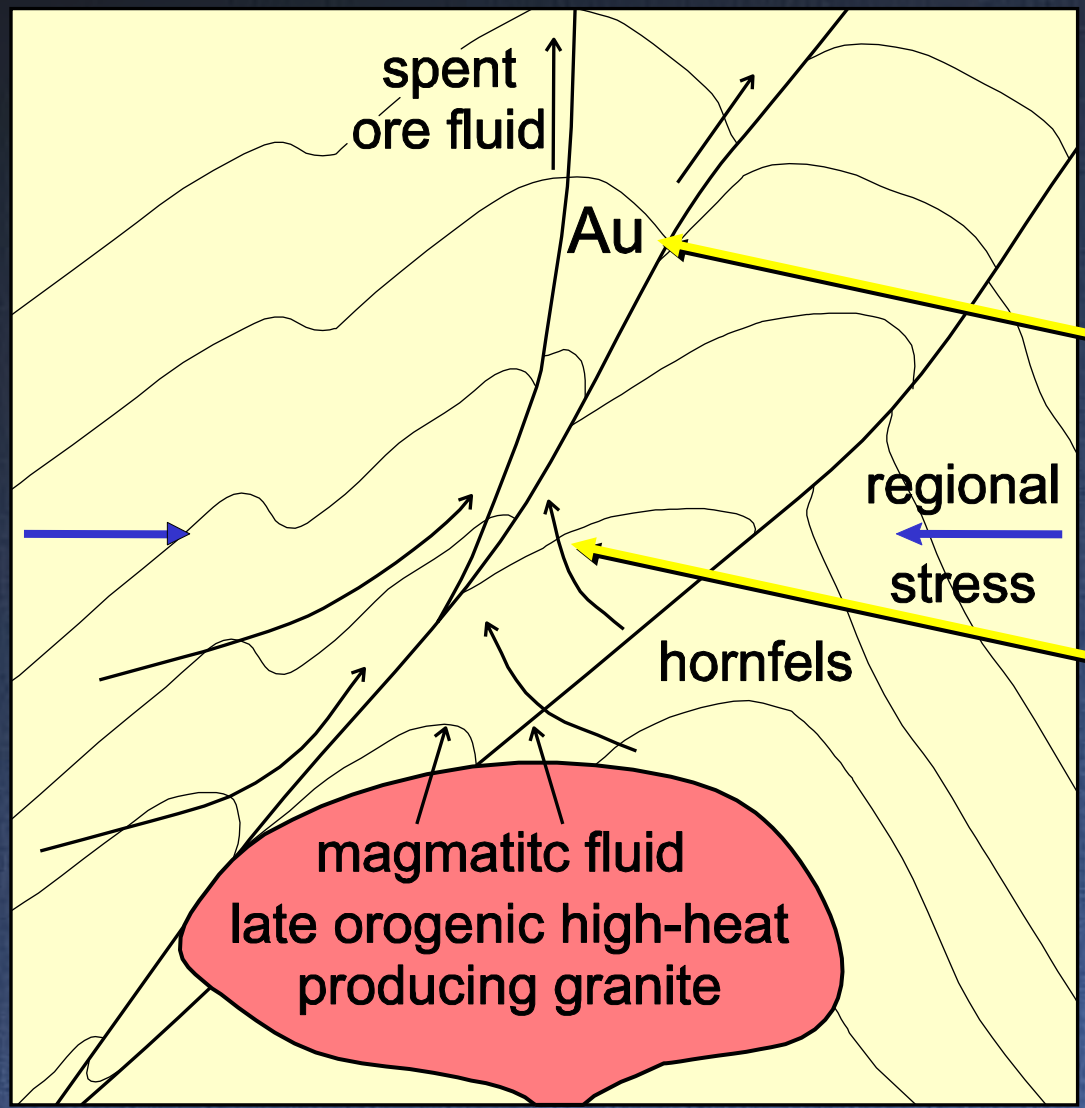
Coyote Au:

- A qtz-mus-biot-kfds-(tourmaline-act-apy) assemblage relate to granite emplacement overprints regional (greenschist facies) metamorphic assemblage.

- The mineralogical similarity between this over-printing assemblage and the vein assemblage suggests that the auriferous veins are associated with the granite-related metamorphic-metasomatic assemblage

- Au deposition is thought to have been caused by pressure drops within dilatant zones

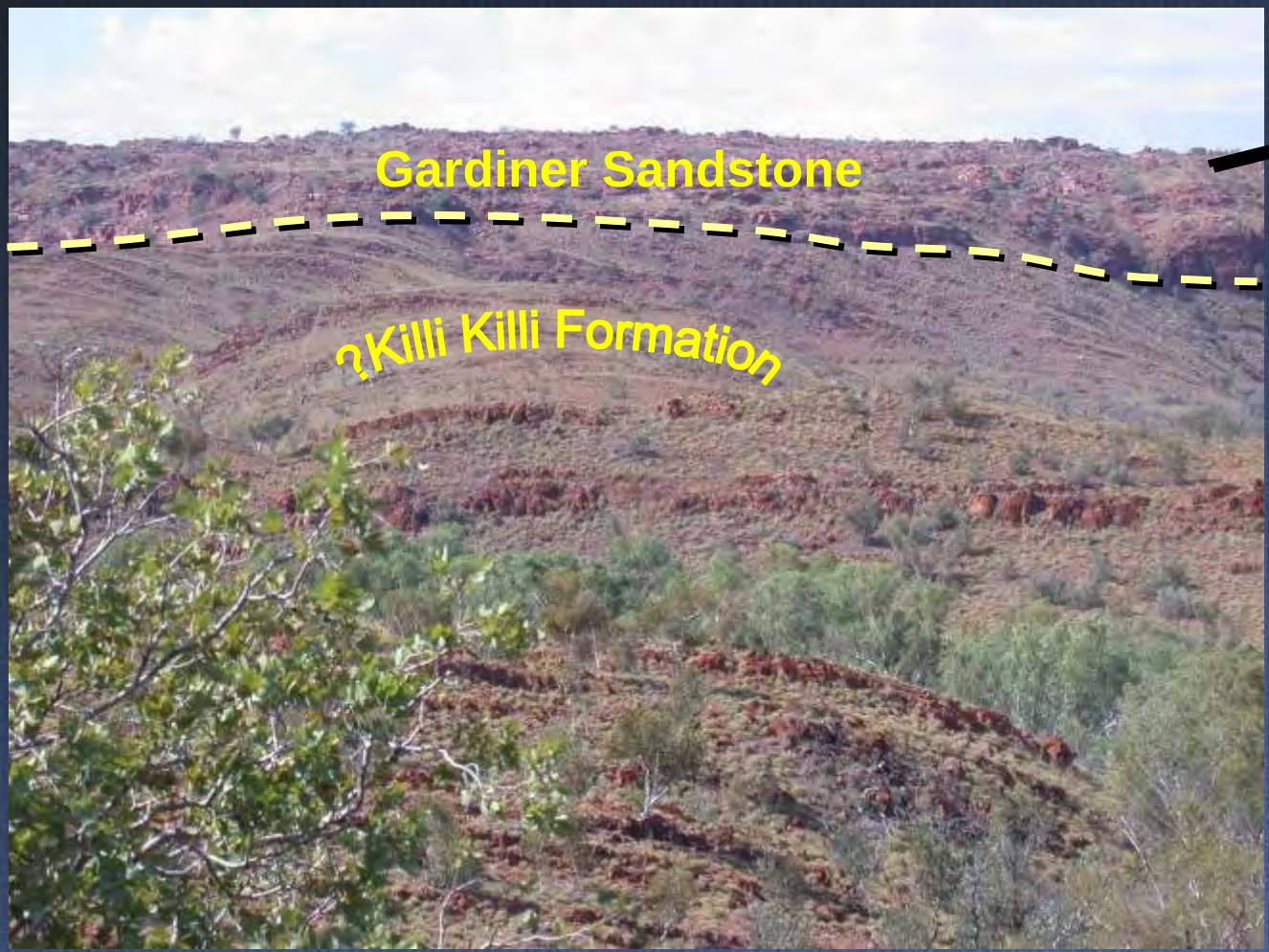
Coyote model

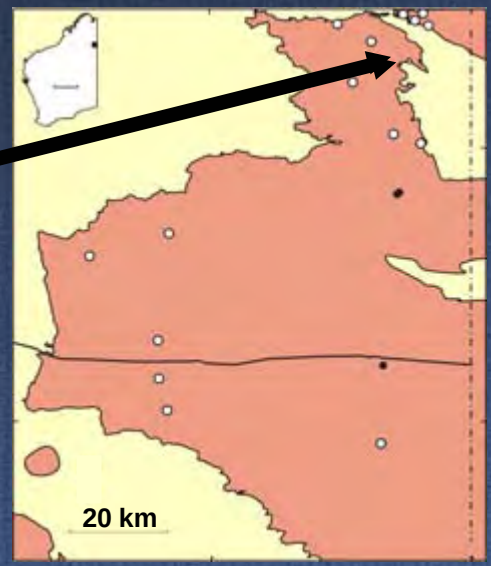


at 290–360°C (~310 °C),
1–13 wt % NaCl equiv.

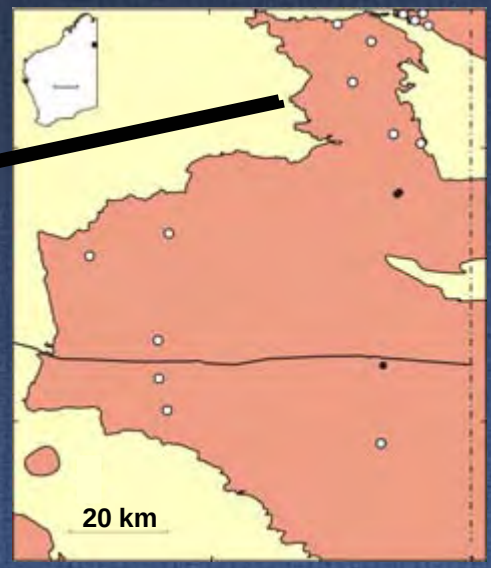
mineralizing fluids driven by pressure gradients formed during magmatic /radiogenic heating

Outcrop east of Bald Hill

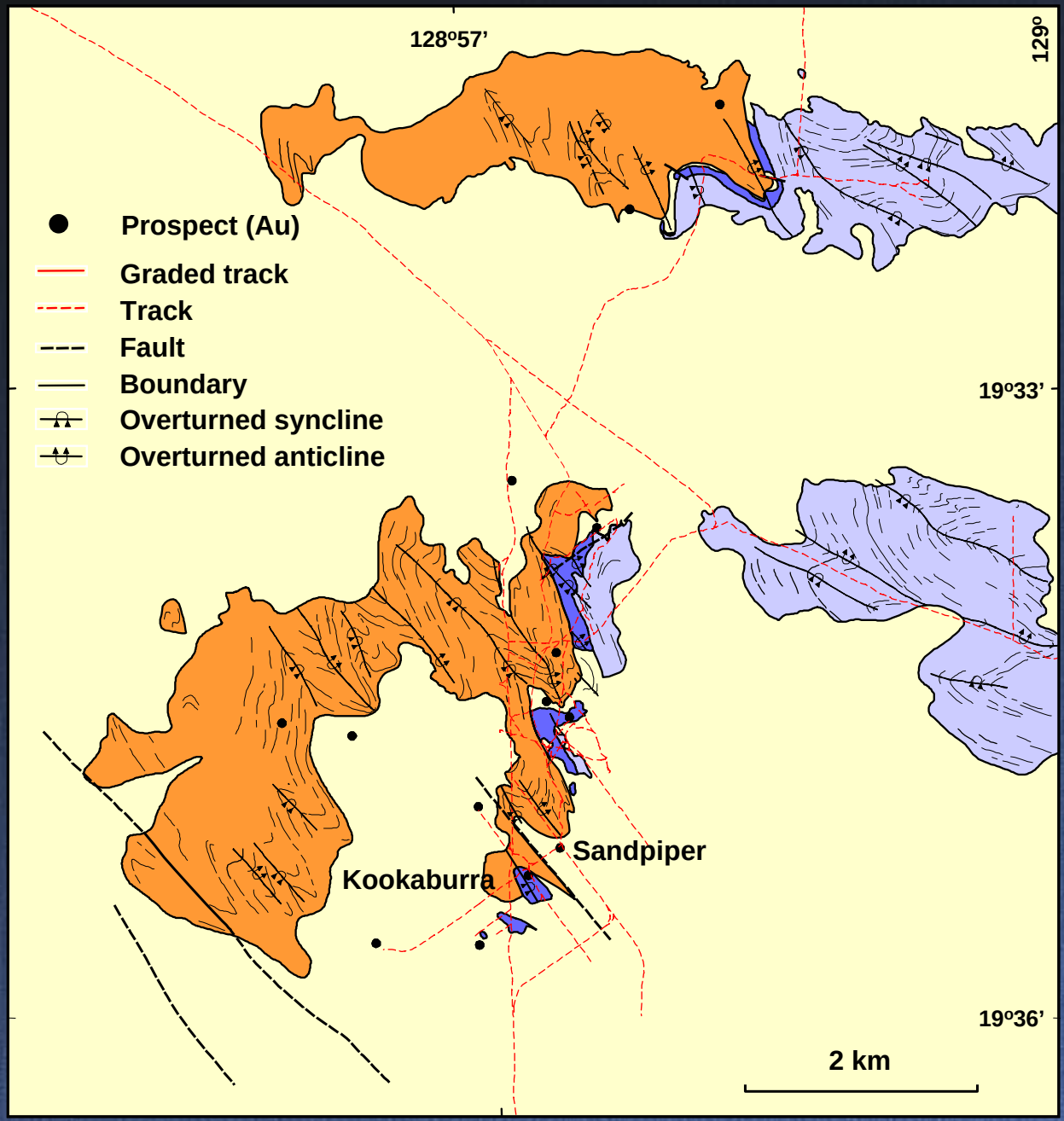


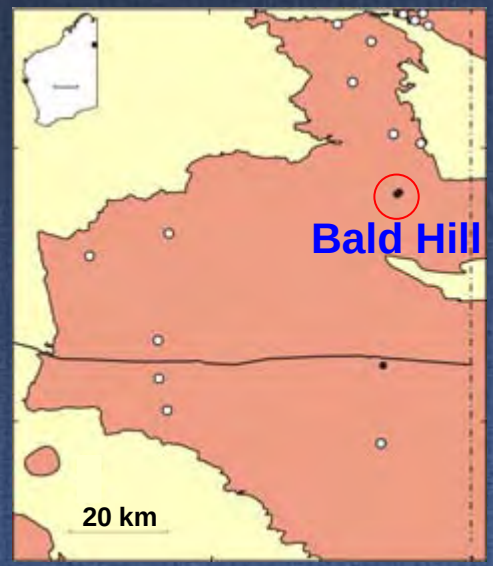


Outcrop west of Bald Hill



Bald Hill





Cenozoic sediments

Metawacke, pelite (Killi Killi Fm (2))

Stubbins Formation

Pelite, chert, metabasalt, rare meta-rhyodacite (c. 1864 Ma)

Metawacke, pelite, dolerite

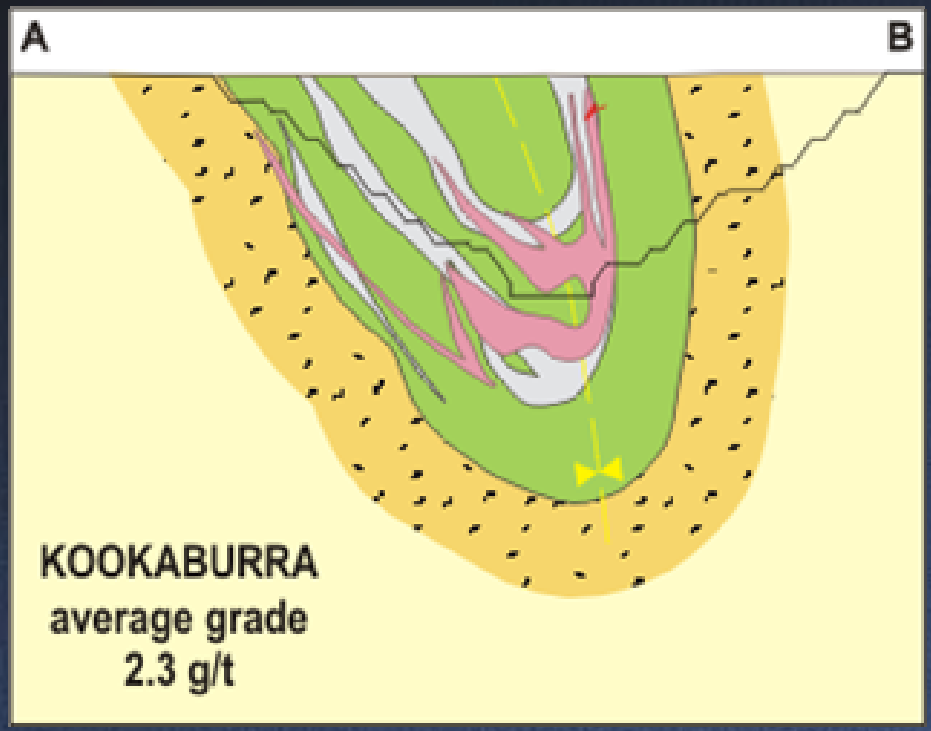
(modified after T. Beardsmore, 2005, written comm.)

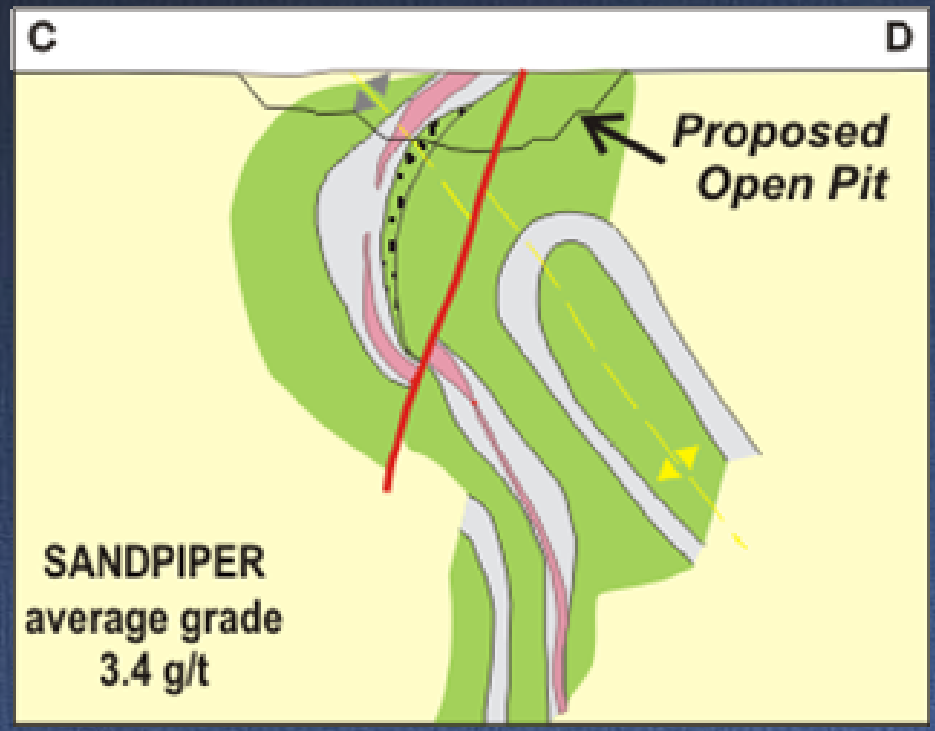
Bald Hill structures

D_{B2}/D_{B3}

D_{B1}/D_{B2}

Bald Hill sections





(modified after L. English, 2006, written comm.)

Mineralized zones

Sheared metabasalt, metadolerite

Metabasalt and metadolerite

Metamudstone to metasandstone

Metawacke dominated graded beds

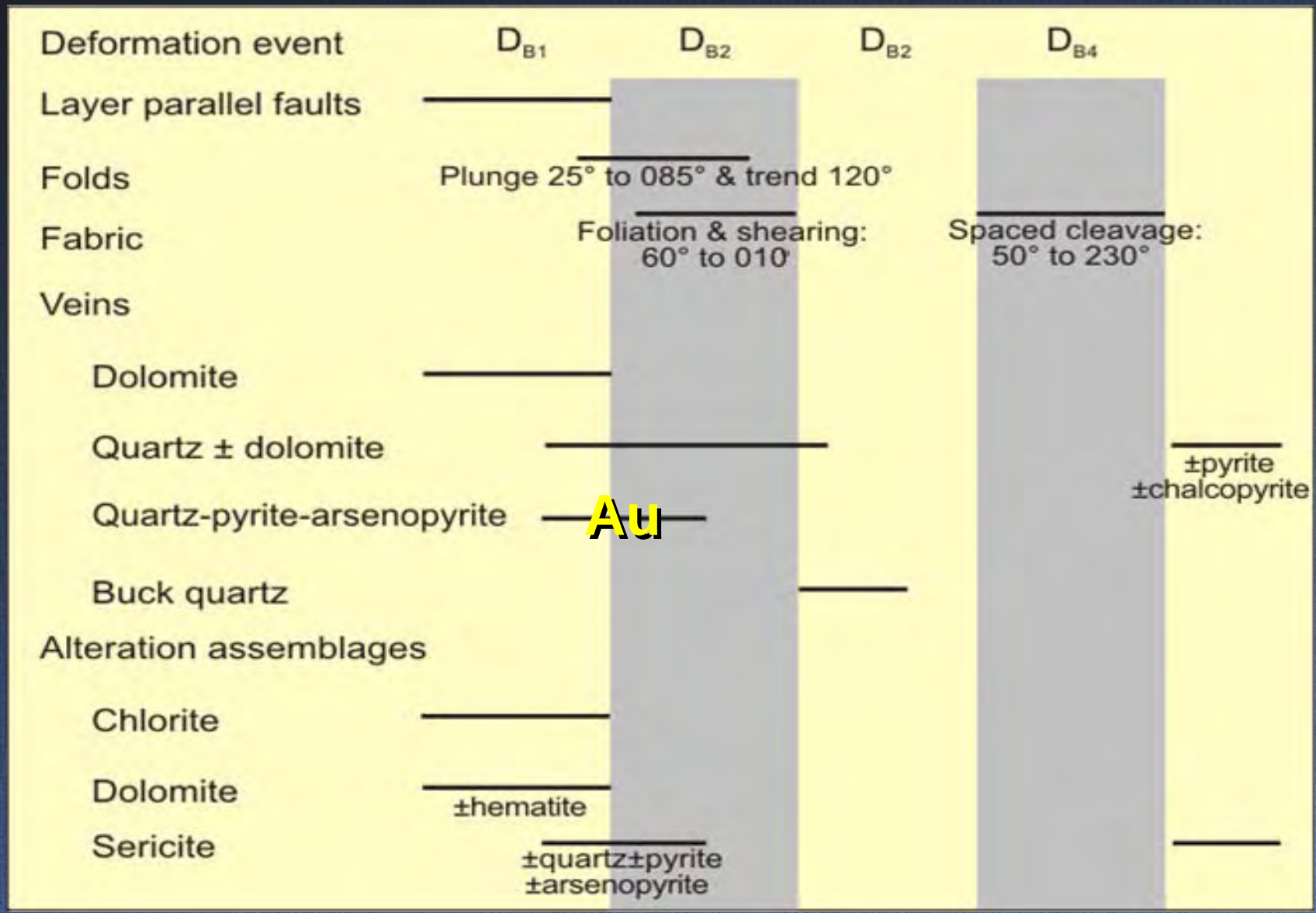
Fault

Syncline hinge

Anticline hinge

0 m 100

Bald Hill deformation events



Bald Hill Au genesis:

- In anastomosing qtz(-apy-py) veins
- The auriferous veins are hosted by earlier structures formed before or during the c. 1835-1825 Ma Tanami Orogeny or earlier; minimum age is 1800 Ma
- Au deposition associated with pressure drops during saddle reef formation (Kookaburra) and chemical reactions with graphitic rocks (Sandpiper) at around 270ºC and 32–37.5 wt.% NaCl equiv. (significantly different from Coyote)

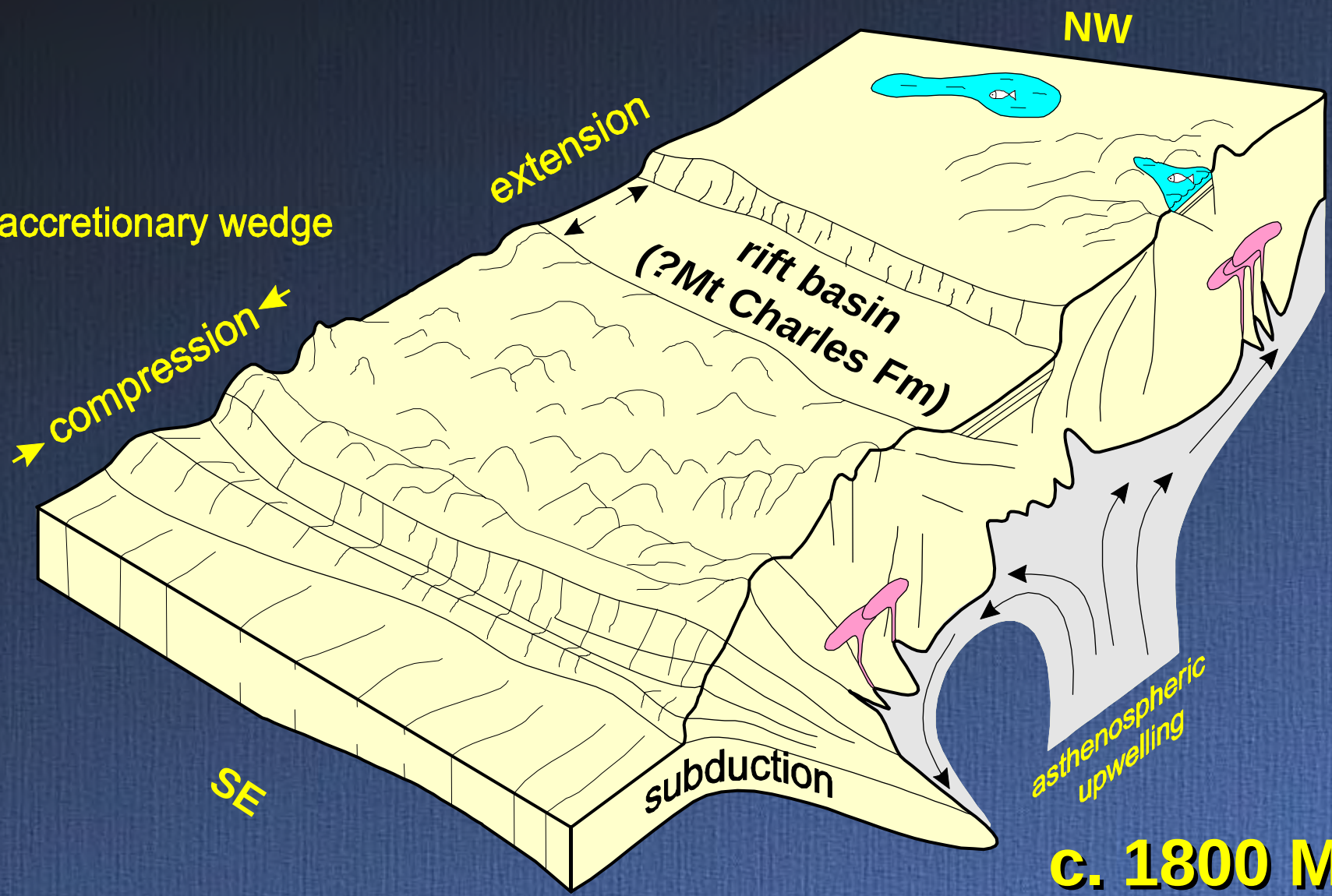
Some conclusions…

- Au was localized by structural and chemical factors at different times
- The first Au event was between c. 1835 Ma (i.e. Tanami Orogeny or earlier) and 1800 Ma in the Bald Hill area
- The second Au event was c. 1790 Ma and associated with the regional D_5 event, during the end of major magmatism
- Au deposition is inferred to have been caused by decreases in fluid pressure, which resulted in effervescence (or boiling)…

Some conclusions…

- These data show that no single model should be used in gold exploration, or you could be left high and dry…

Arm waving:



c. 1800 Ma

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