

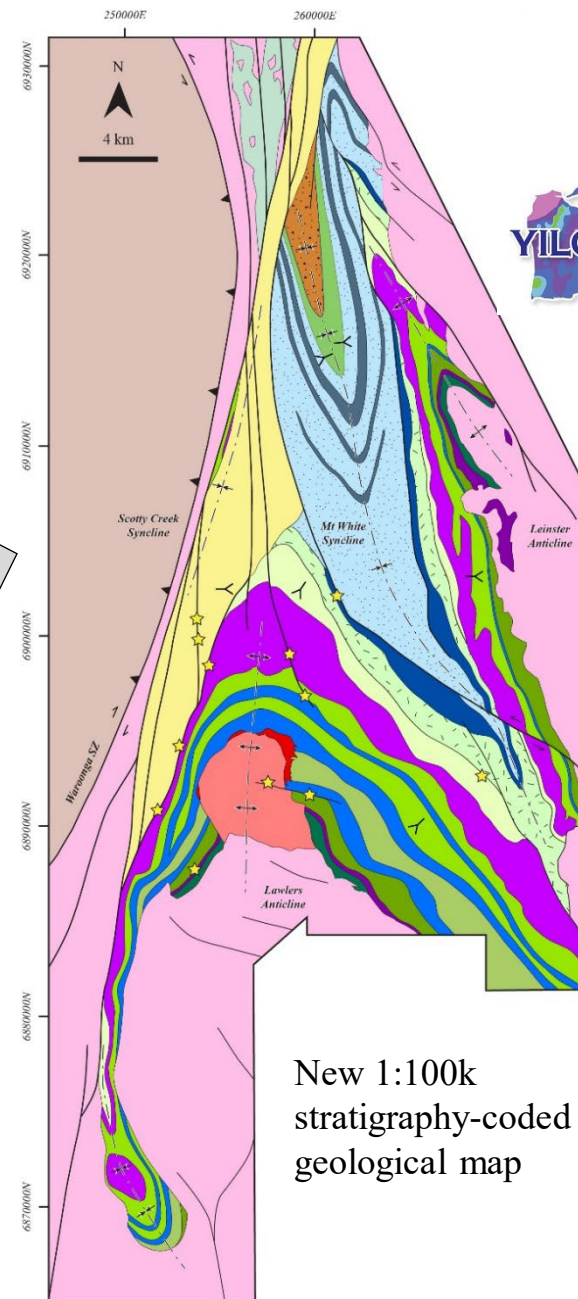


A fresh look at the stratigraphic record in the Agnew-Wiluna belt: implications for the geological evolution of the Yilgarn Craton

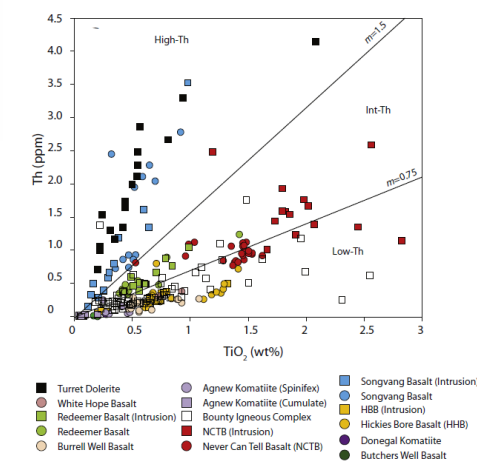
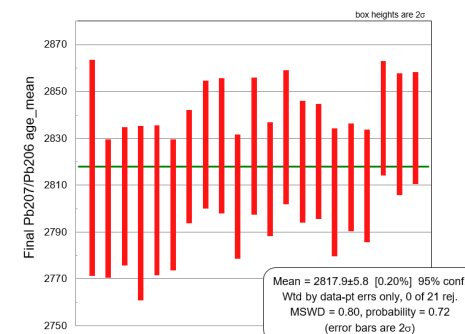
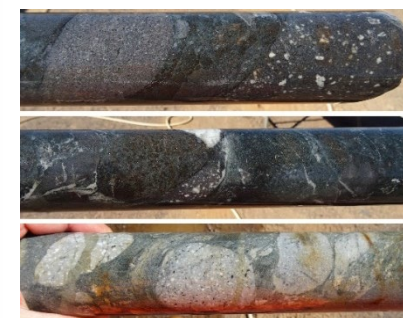
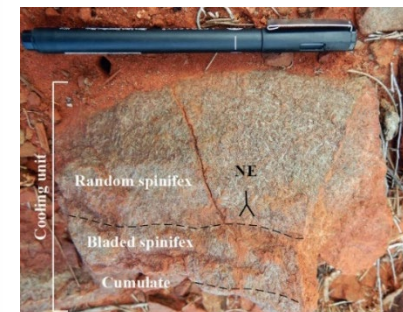
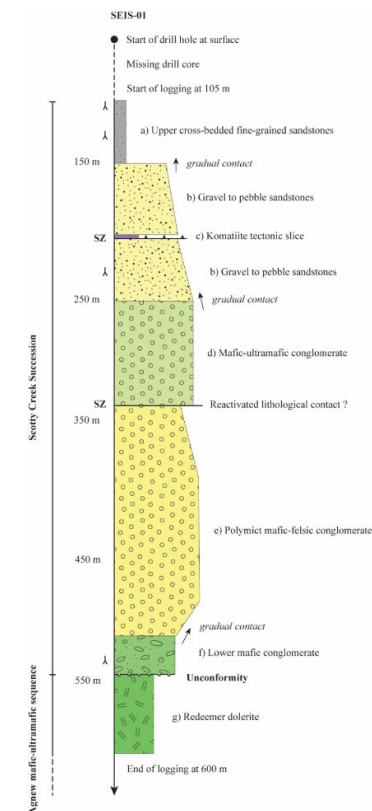
Q. Masurel, N. Thébaud



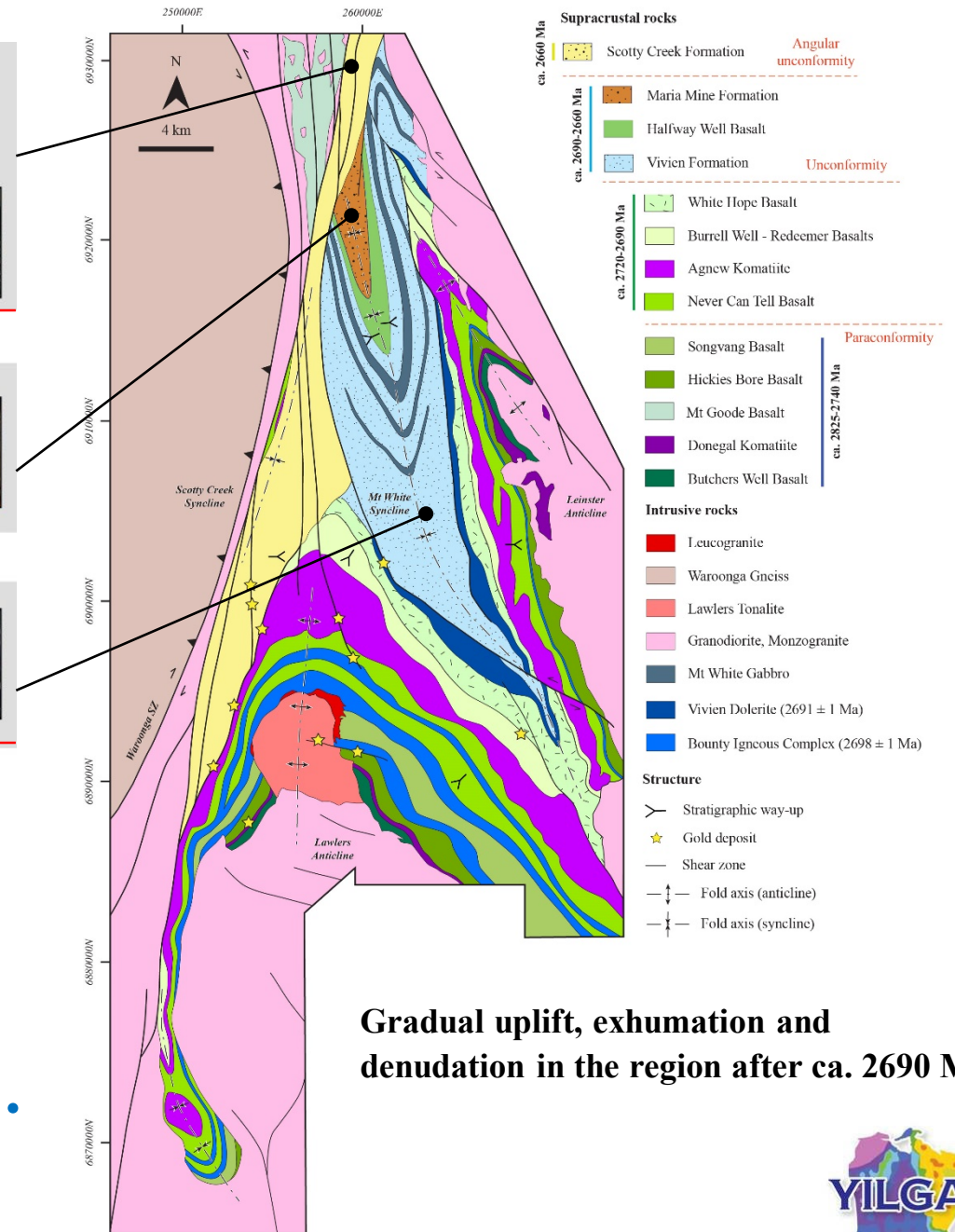
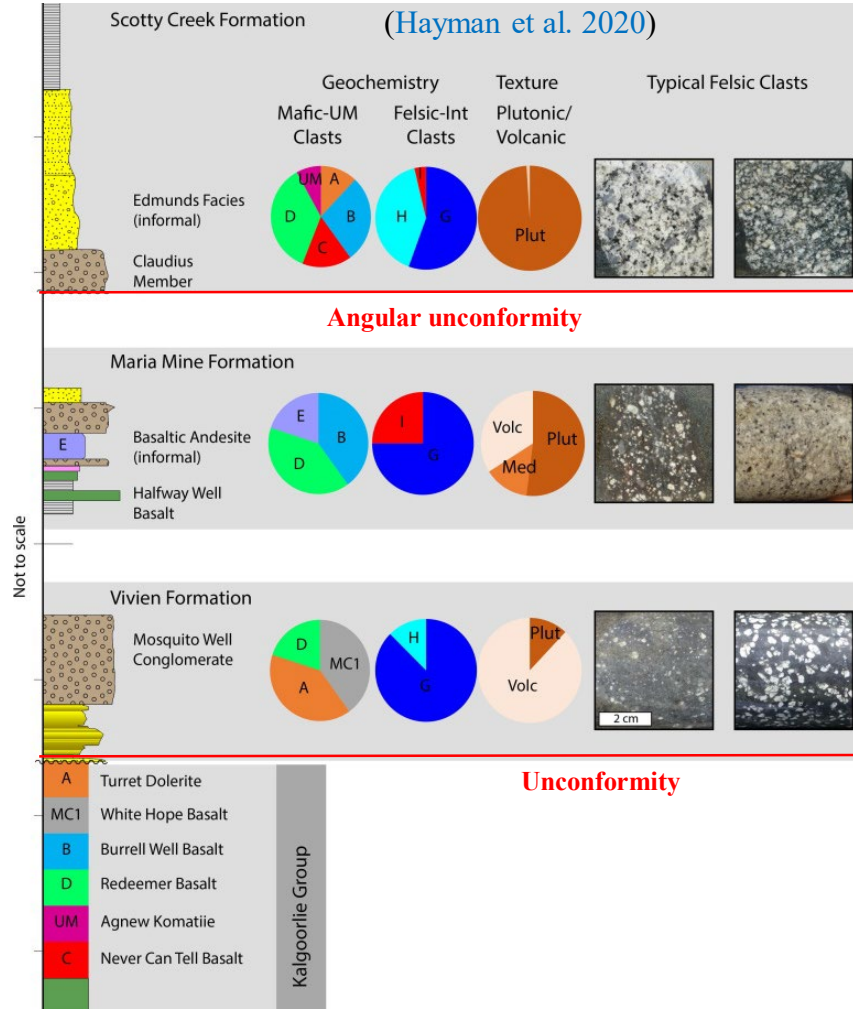
GSWA 2014
1:100k
geological map



A stratigraphic perspective

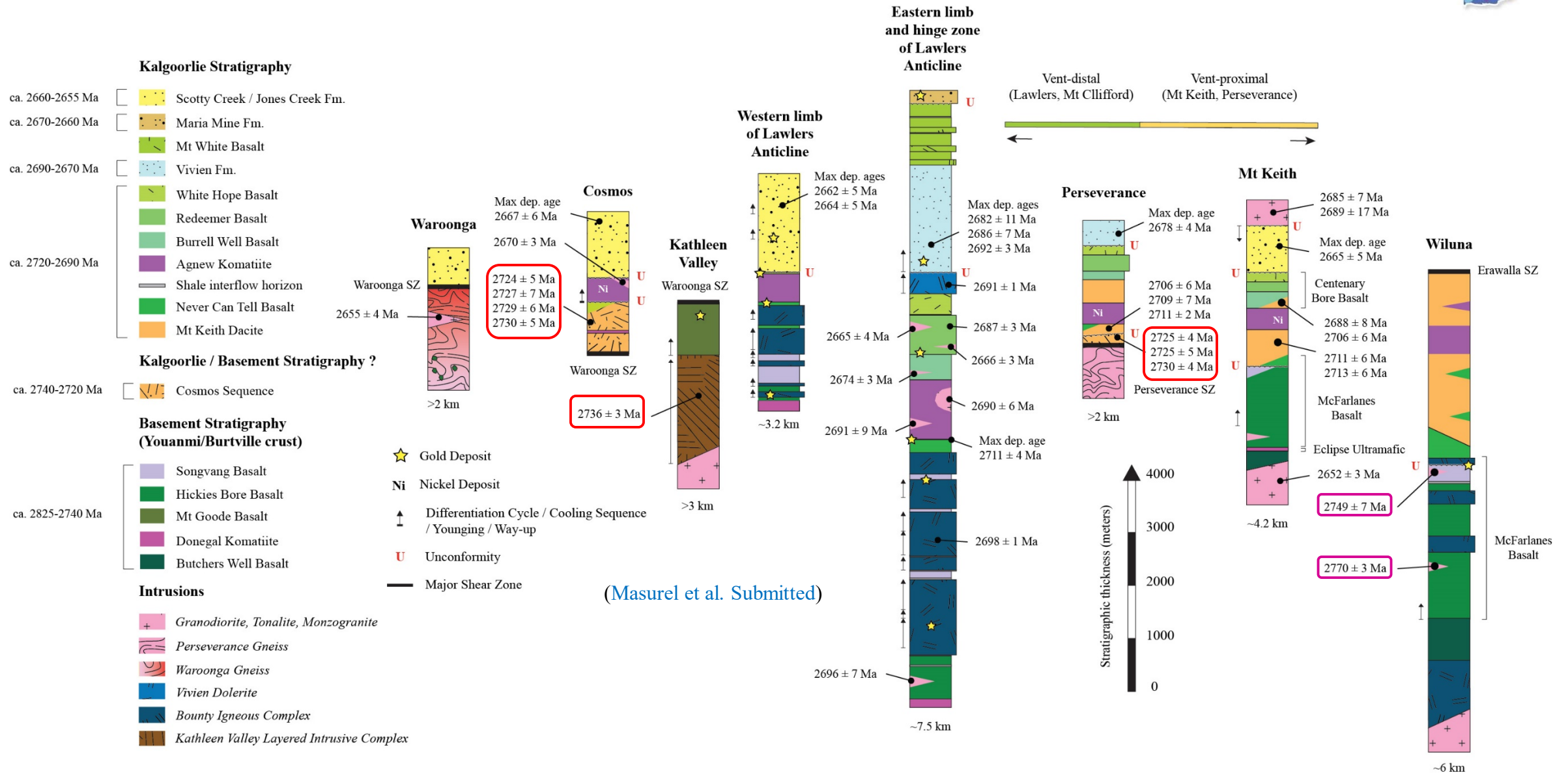


Time

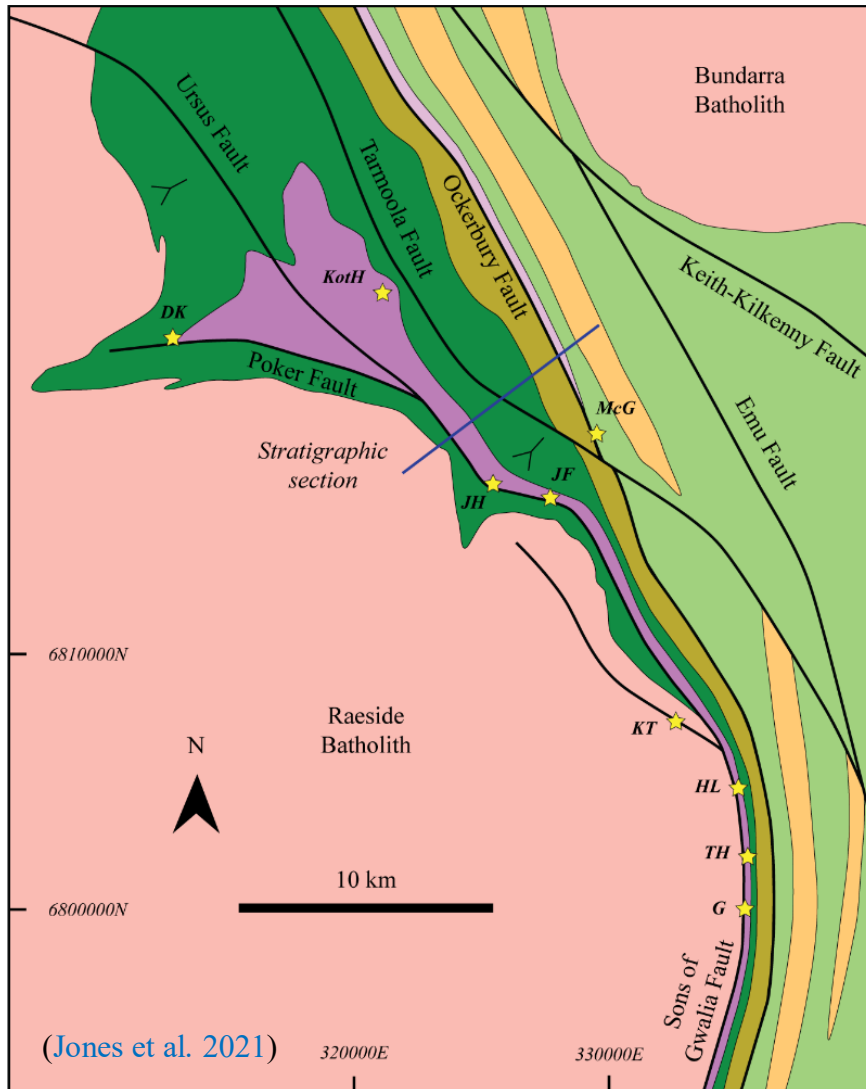


Post-2690 Ma history: What we know best...
But is it the most interesting ?

On the presence of pre-2720 Ma crustal fragments in the AWB



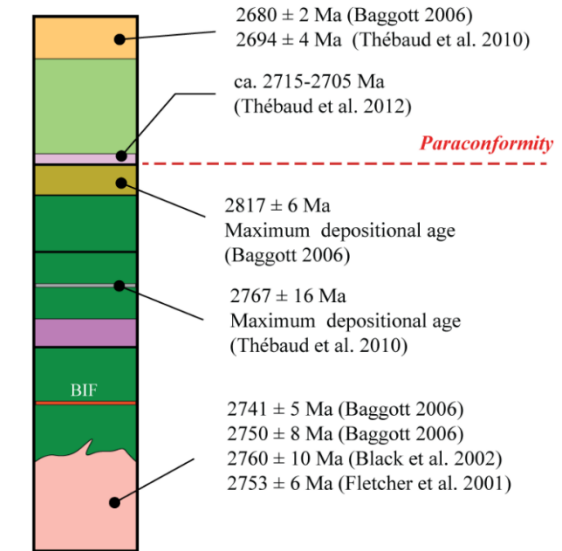
Insights from the Leonora geological domain



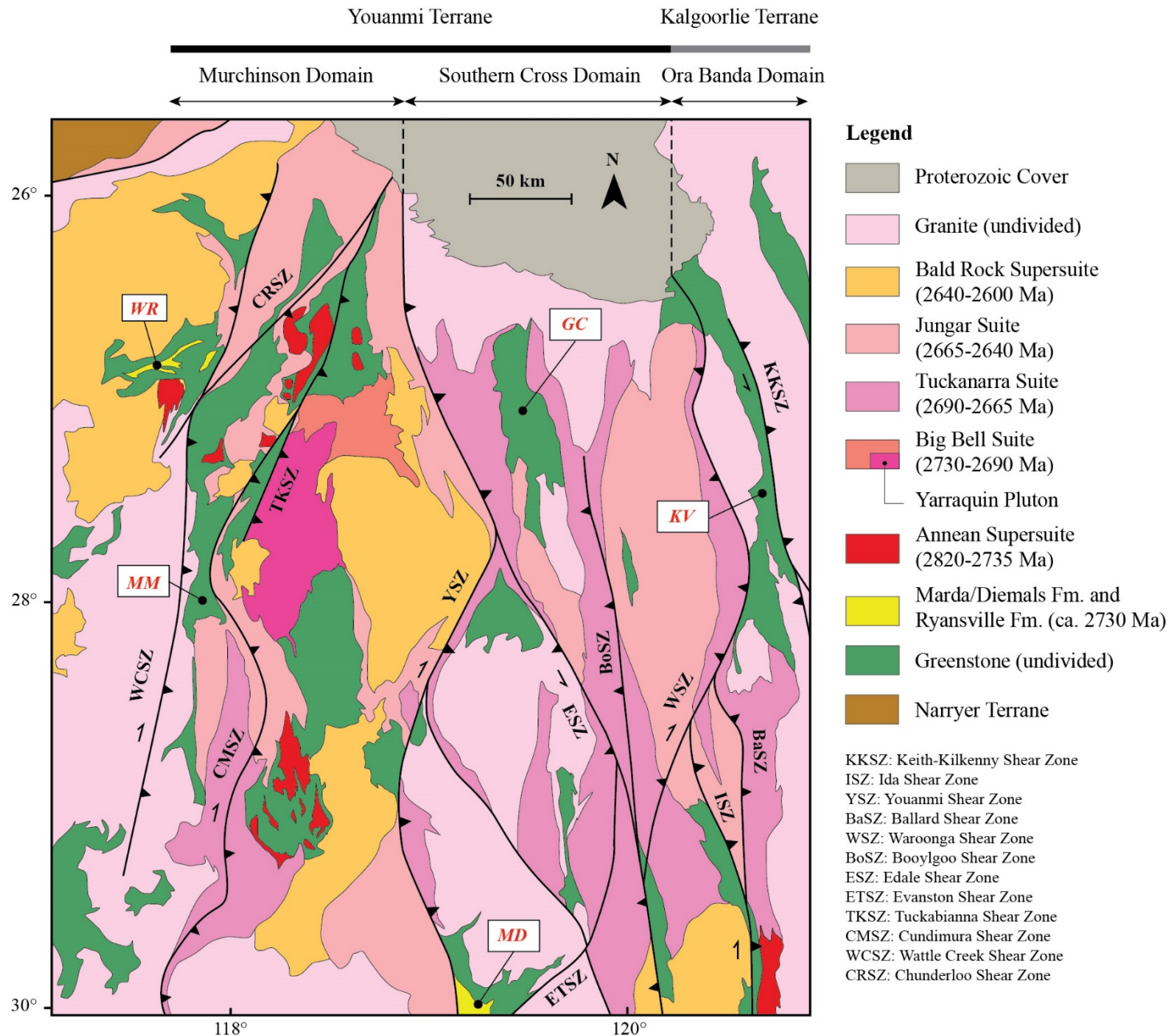
Map legend

- Gindalbie felsic volcanic and associated volcanoclastic rocks
- Eastern domain basalts with minor interflow chert/mudstone horizons
- Sullivans ultramafic unit
- Mt George volcano-sedimentary rock sequence (greywacke, quartzite and chlorite schist)
- Leonora ultramafic unit
- Jasper and Gwalia Fm. (basalts with minor BIF, chert, and interflow mudstone)
- Younging (pillows)
- Gold deposit

Stratigraphic column



- Western mafic-ultramafic sequence is older than ca. 2750 Ma
- Western mafic-ultramafic sequence conformably overlain by Mt Clifford Fm. affiliated to ca. 2720-2690 Ma mafic-ultramafic sequence in the Agnew-Wiluna belt based on shared lithostratigraphic, geochemical, and textural properties (Thébaud et al. 2012)
- Paraconformable contact (>50 myr hiatus in volcanism)



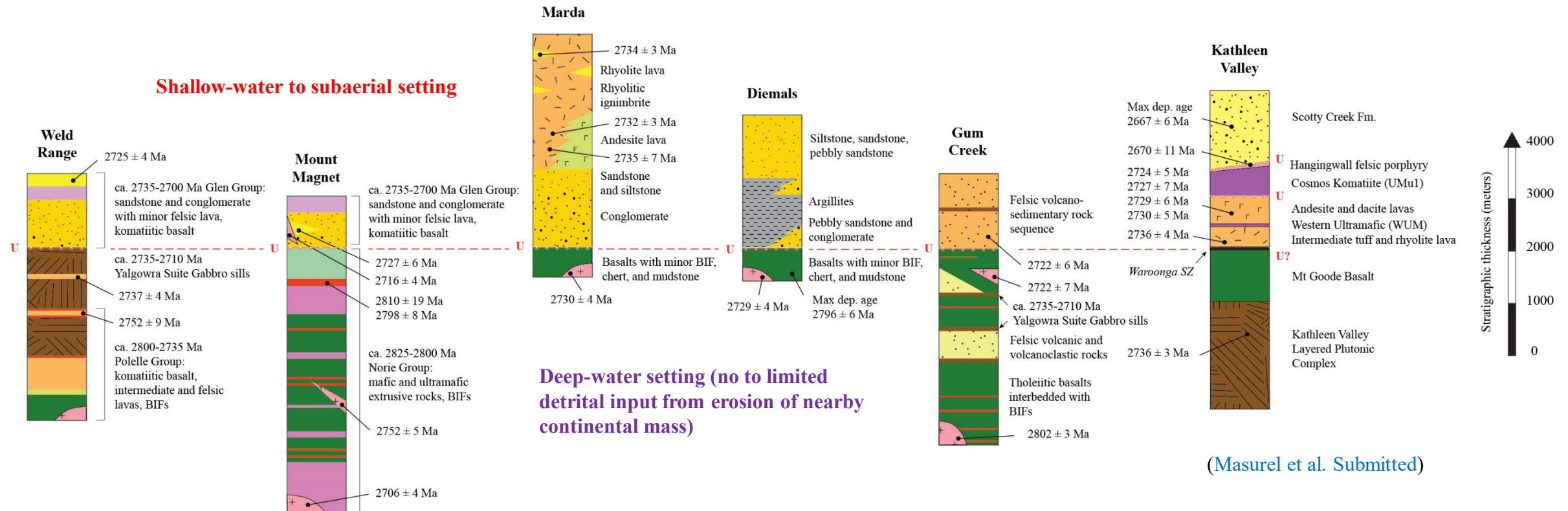
On the ca. 2730 Ma regional stratigraphic unconformity

- Clastic and felsic volcanic rock sequences deposited in shallow marine to subaerial conditions across the Youanmi Terrane and derived from the erosion of underlying ca. 2960-2750 Ma deep-marine greenstone successions
- Original extent of the ca. 2730 Ma unconformity and internal stratigraphy is necessarily incomplete due to subsequent deformation and erosion...



(Zibra et al. 2017)

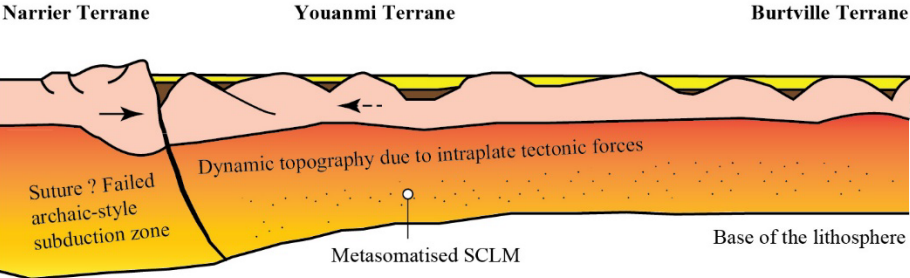
~2730 Ma Youanmi-wide stratigraphic unconformity



- Youngest felsic volcanic rock for the Youanmi Terrane is 2722 ± 6 Ma (Gole et al. 2019) and the maximum age for deposition of the NCT Basalt in the Kalgoorlie Terrane is 2711 ± 4 Ma (Hayman et al. 2015)
- Felsic magmatism was virtually continuous from ca. 2730 Ma onwards ?

ca. 2730 Ma regional unconformity and dacite-rhyolite volcanism

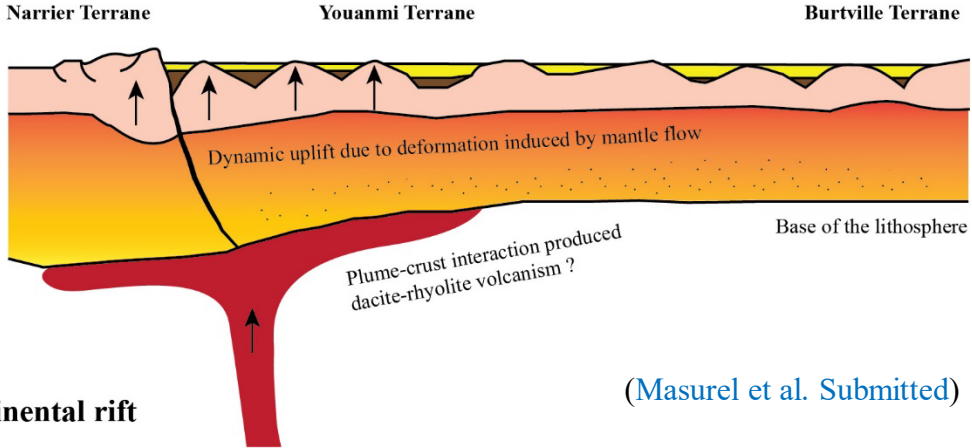
Docking of the Narriyer Terrane against the Youanmi Terrane at ca. 2740 Ma



?

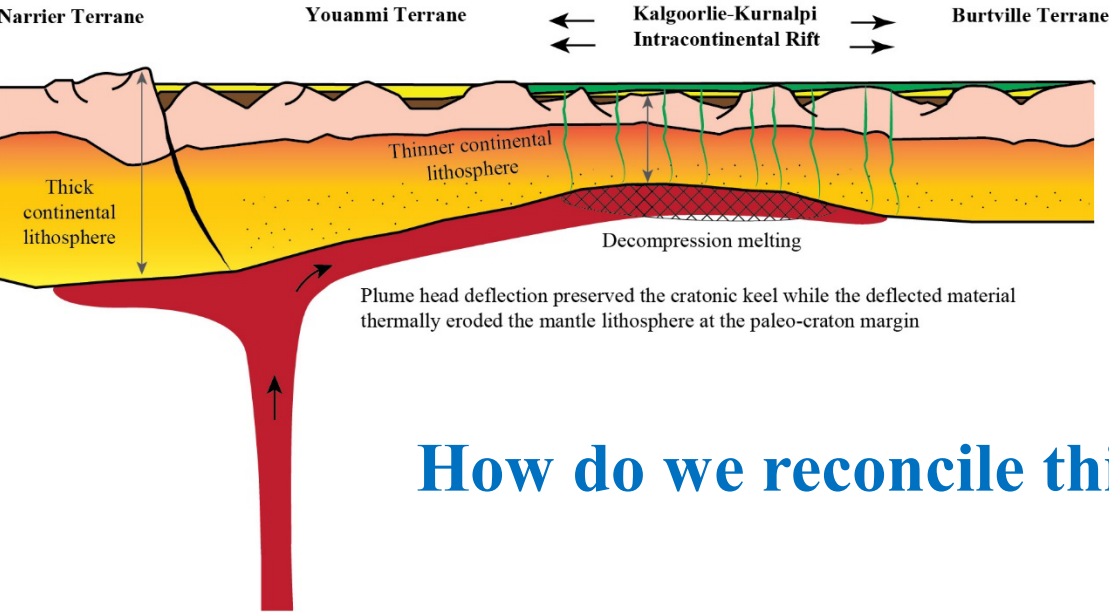
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
Mantle upwelling zone impinging the Youanmi lithospheric keel at ca. 2730 Ma



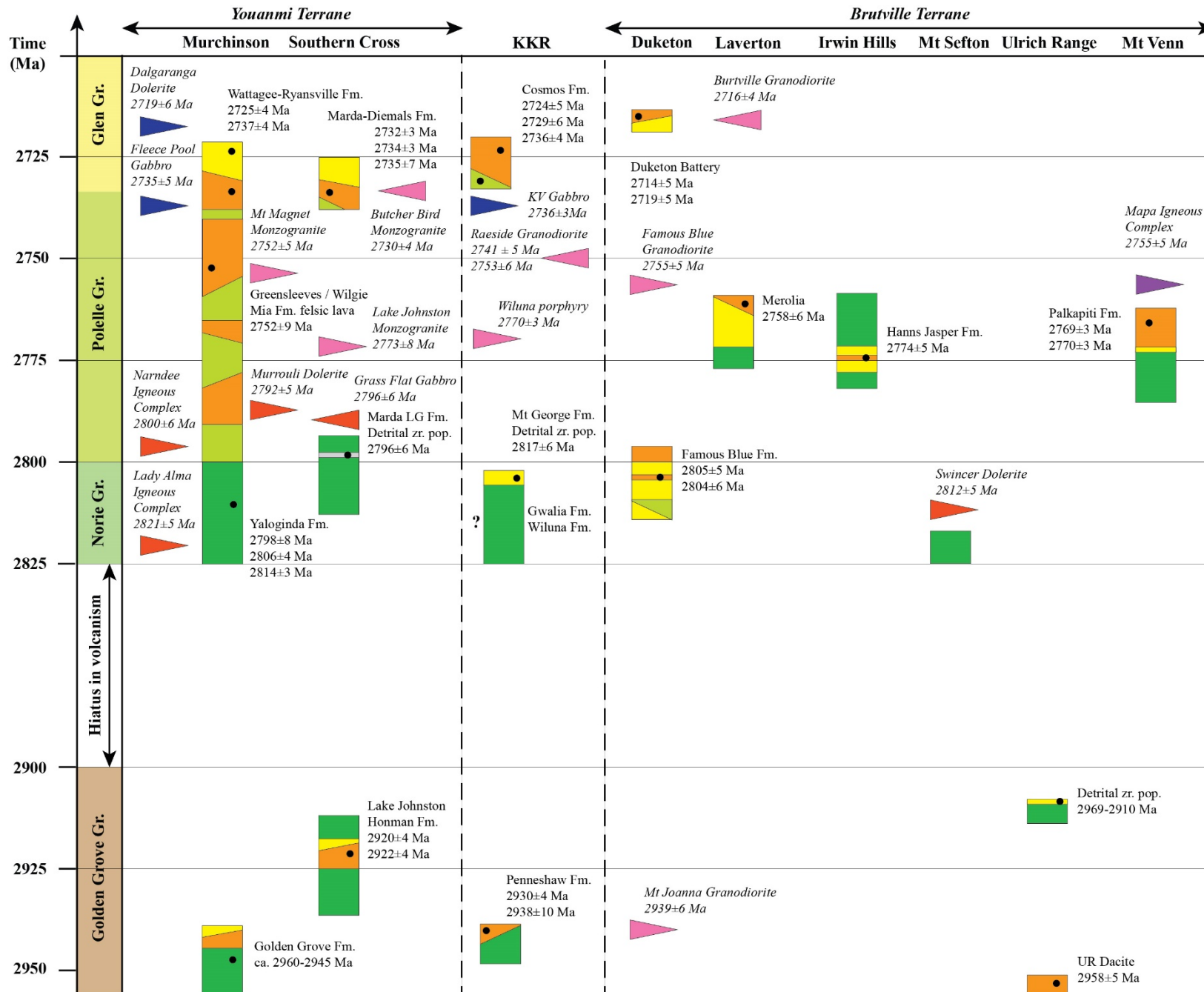
(Masurel et al. Submitted)

ca. 2720-2690 Ma Extension and thinning, Kalgoorlie-Kurnalpi failed intracontinental rift



-  Kalgoorlie-Kurnalpi Large Igneous Province (ca. 2720 -2690 Ma)
-  Transitional Sequence (ca. 2740-2720 Ma)
-  Basement to Kalgoorlie-Kurnalpi LIP (ca. 3100-2740 Ma or >3100 Ma)
-  Sub-Continental Lithospheric Mantle
-  Tangential / Body forces

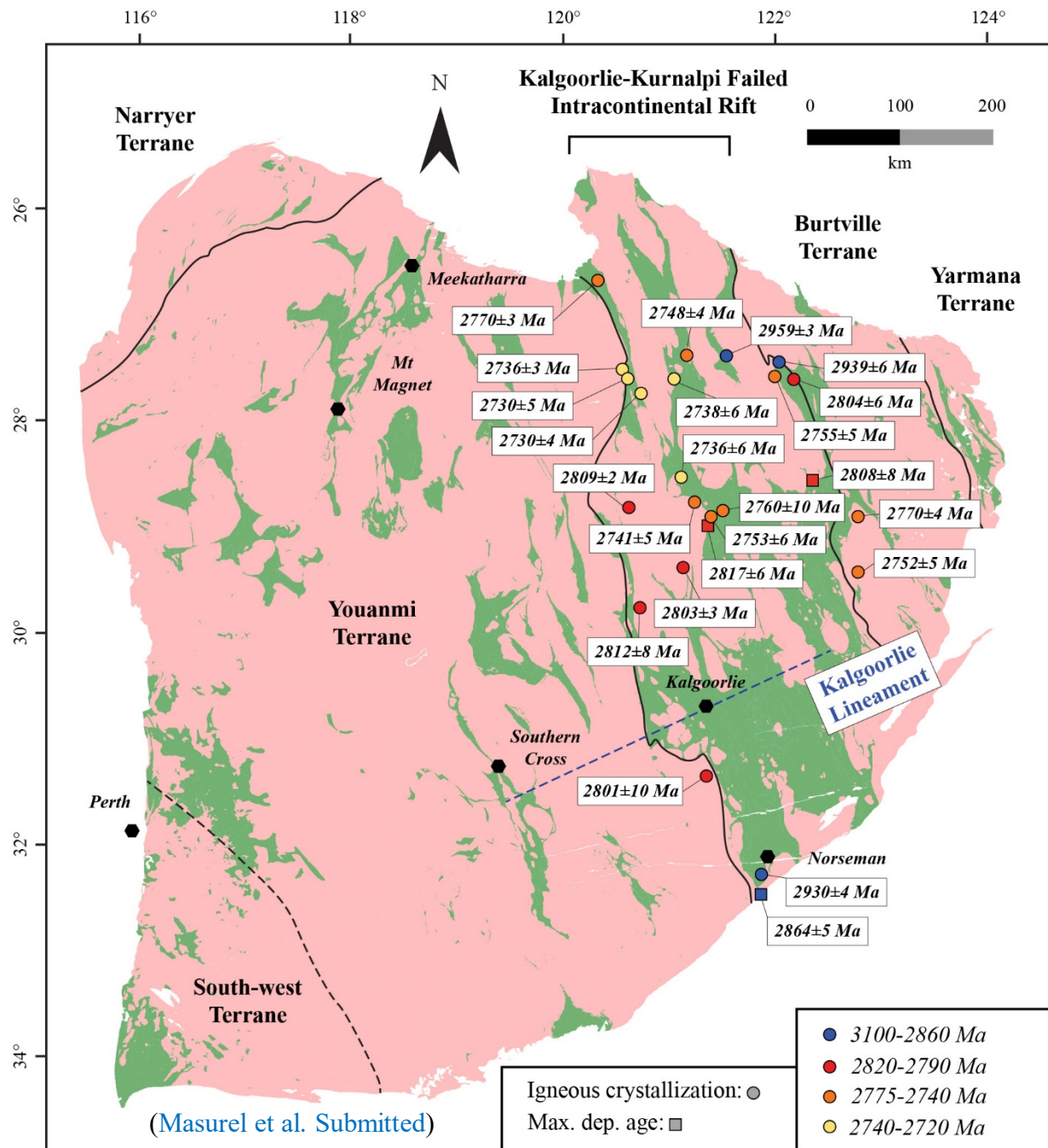
How do we reconcile this 1st-order stratigraphic knowledge ?



Towards an integrated scenario

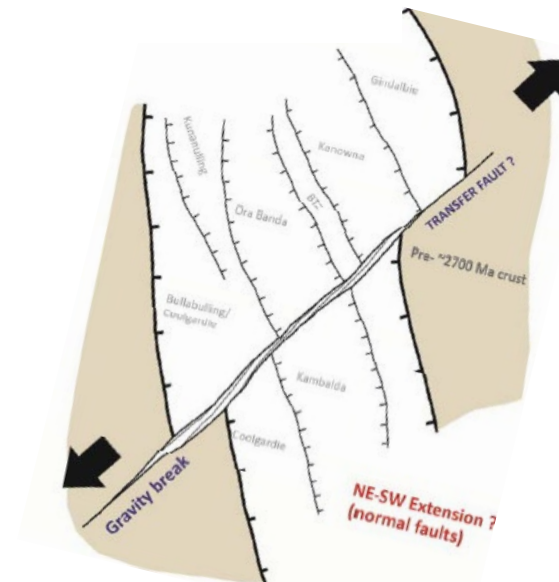
- Major crustal growth in Youanmi Terrane & Burtville Terrane between ca. 2825 and 2730 Ma
- Orphaned sections of Youanmi/Burtville-aged crust floor younger supracrustal rafts in the KKR
- Proto-Yilgarn thinned but not completely rifted to the point of oceanic crust formation → Failed intracontinental rift

Compiled after Ivanic et al. 2010; Pawley et al. 2012



Insights into the failed intracontinental rift architecture ?

- Greater abundance of basement fragments identified in the north-central part of the KKR compared to its southern counterpart
- “Kalgoorlie Lineament” (Archibald 1978; Tripp 2013; Harris and Bédard 2015; Doutre 2018; Mole et al. 2019) represents a fundamental basement discontinuity (i.e. transfer zone) that accommodated differential extension between a northcentral and southern blocks ?

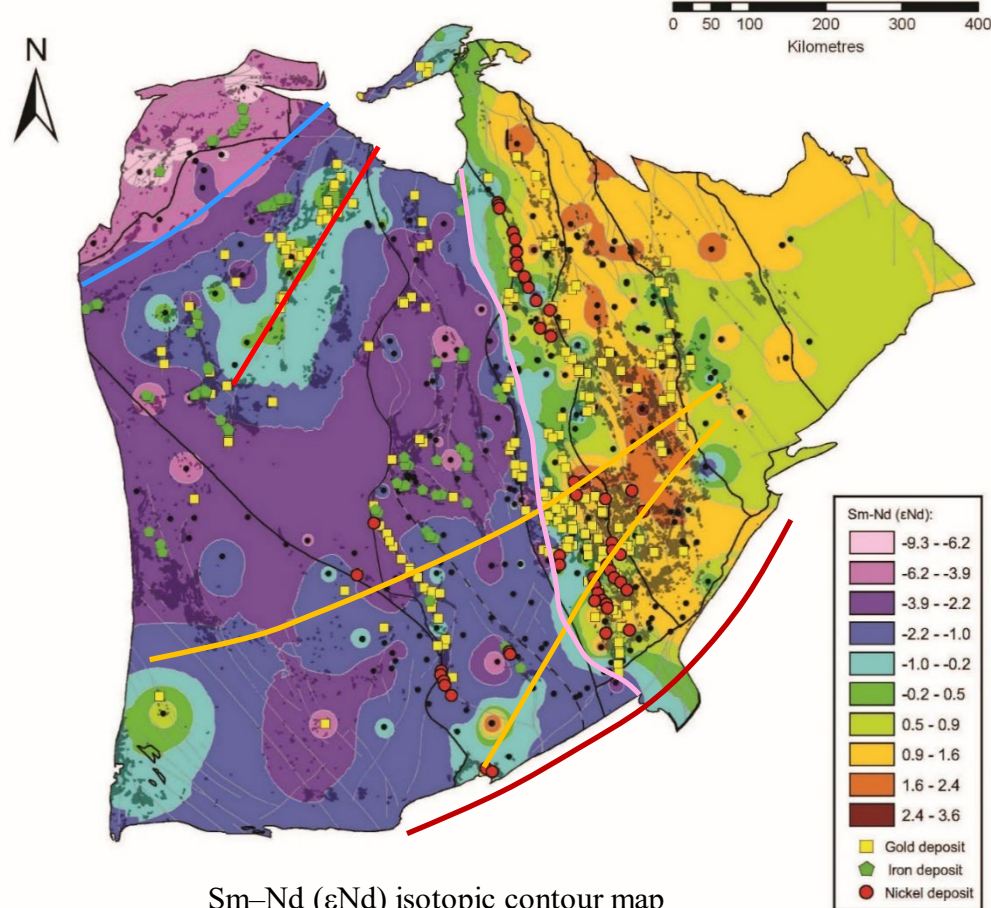


Chasing basement discontinuities in the Yilgarn Craton...



**EASTERN GOLDFIELDS
GEOCHEMICAL BARCODING**

Geological Survey of
Western Australia



Sm-Nd (ϵ Nd) isotopic contour map
(after Mole et al. 2013)

Potential multi-stage geometric control on the Kalgoorlie-Kurnalpi rift architecture (i.e. structural inheritance)

~3700 Ma rifting along Narryer – northcentral Southern Cross Domain margin creating the Murchinson Domain
~2825-2740 Ma plume-related rift basin transitioning into back-arc basin

~3050-2825 Ma rifting across the craton

~2760-2740 Ma Narryer-Murchinson collisional front

~2720-2690 Ma Kalgoorlie-Kurnalpi rift axis parallel to reactivated proto-craton margin (crustal extraction and growth of the Burtville Terrane at ~3500-3300 Ma via craton margin magmatism)

~1805 Ma Albany-Fraser rift (inherited weak zone?)