Presentation given at the Specialist Group in Tectonics and Structural Geology, Thredbo, NSW in 2015

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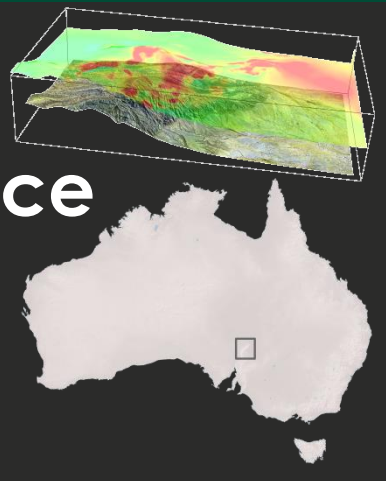
MONASH University

School of Geosciences

Tectonic evolution of the Early Mesoproterozoic Mount Painter Province



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Monash Structural Geophysics Group

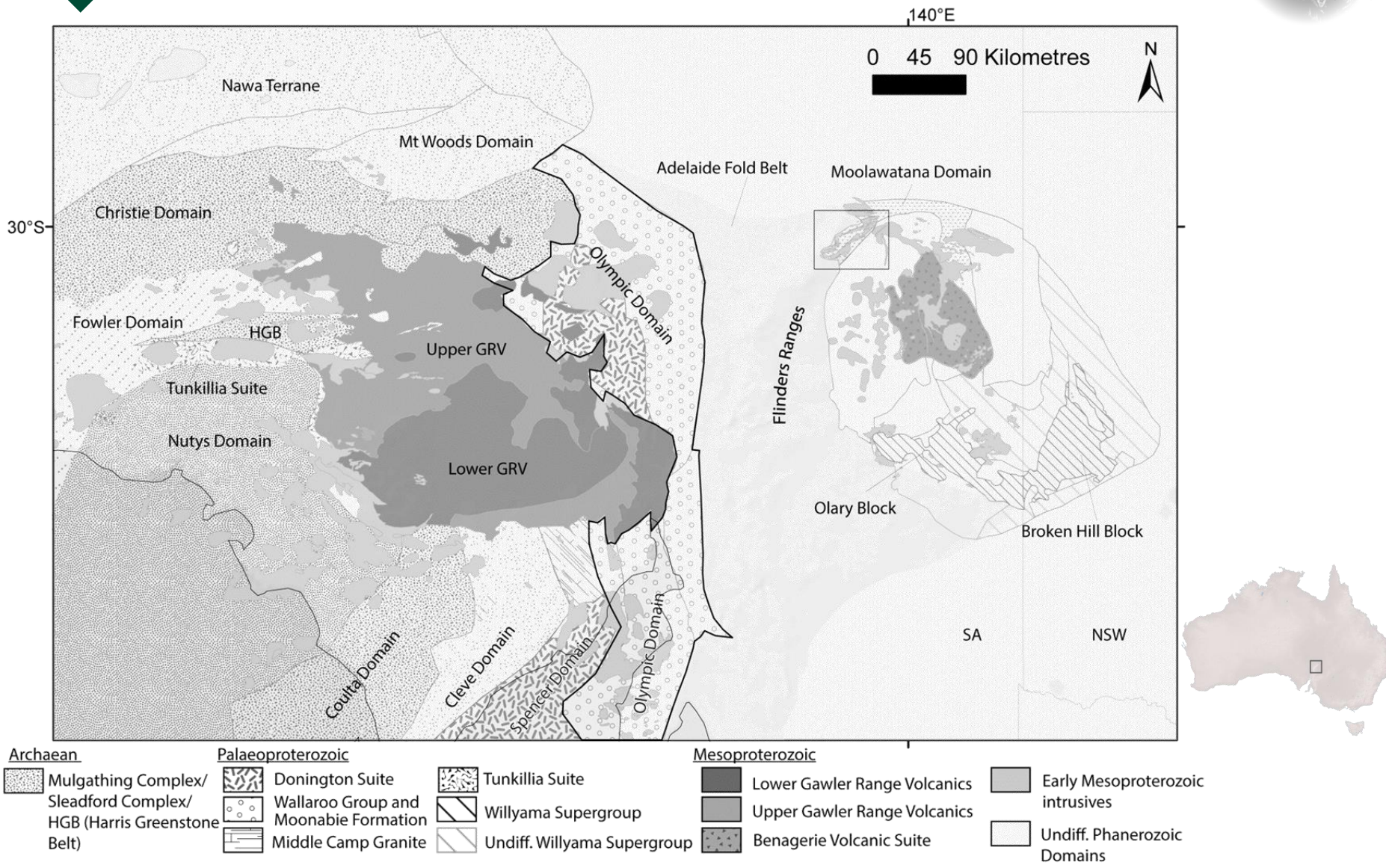
GEMOC

Government of South Australia
Department for Manufacturing, Innovation, Trade, Resources and Energy

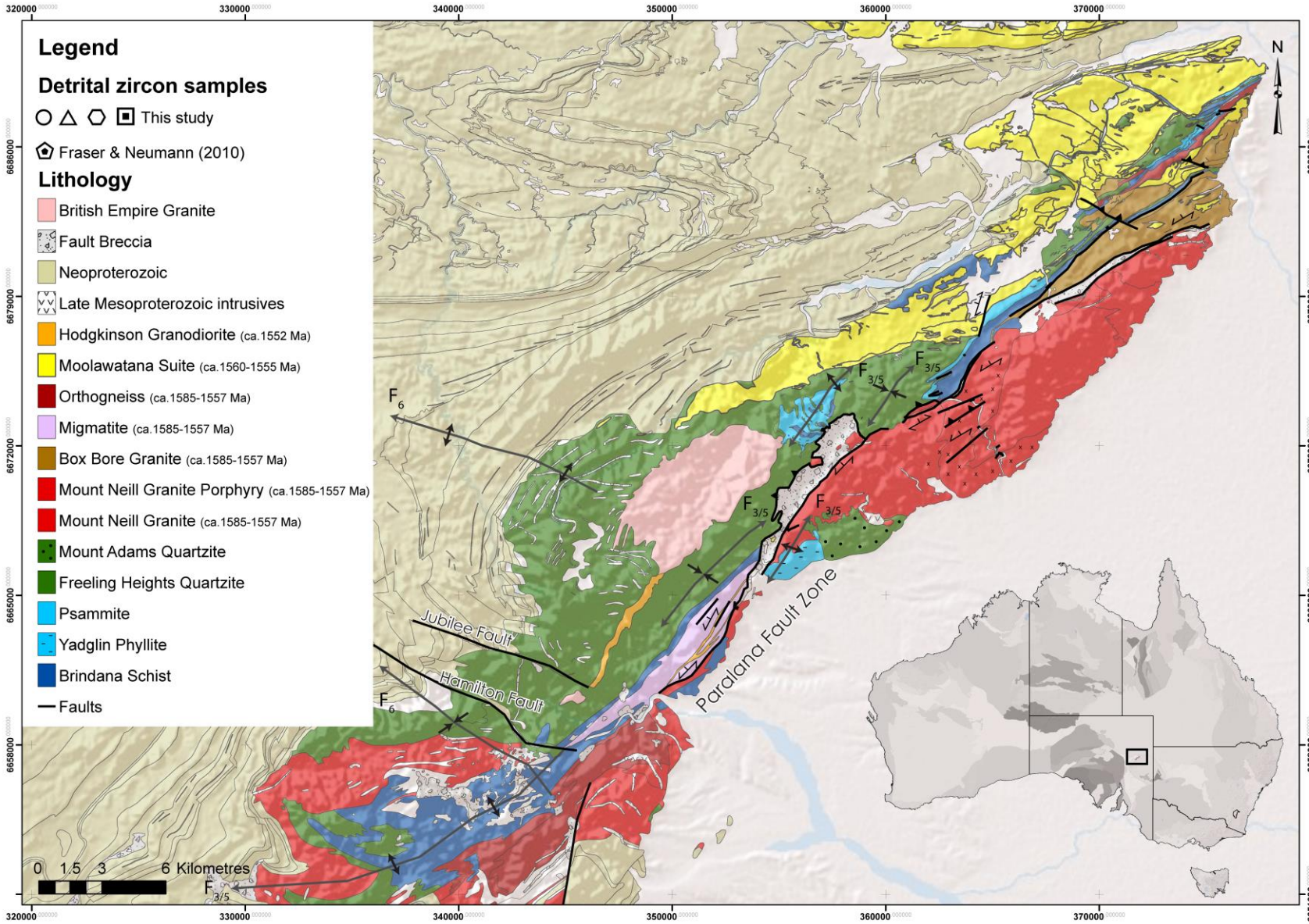
Outline

- Characterise the U-Pb-Hf signature of the Radium Creek Group.
- Explore potential provenance for these metasediments.
- Examine the structural evolution of the Mesoproterozoic Mount Painter Province.
- Correlate tectonic framework across Proterozoic eastern Australia.

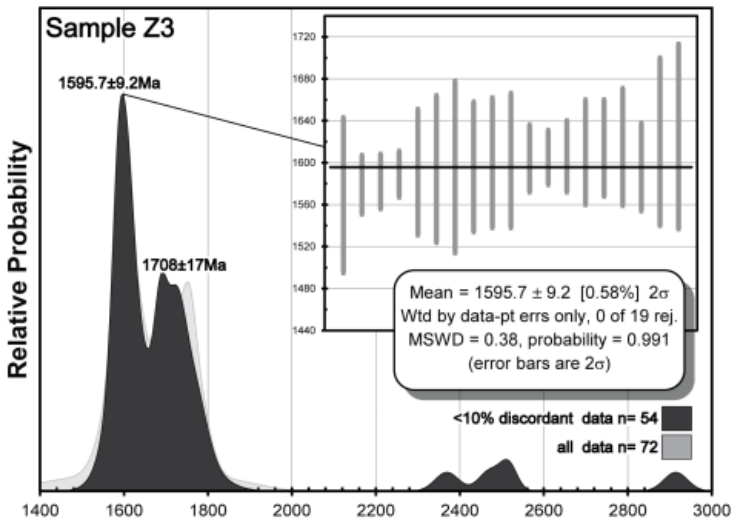
Introduction

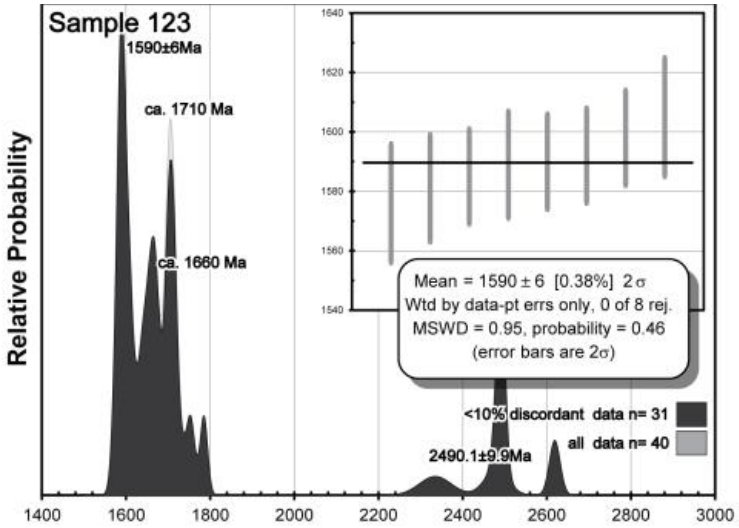


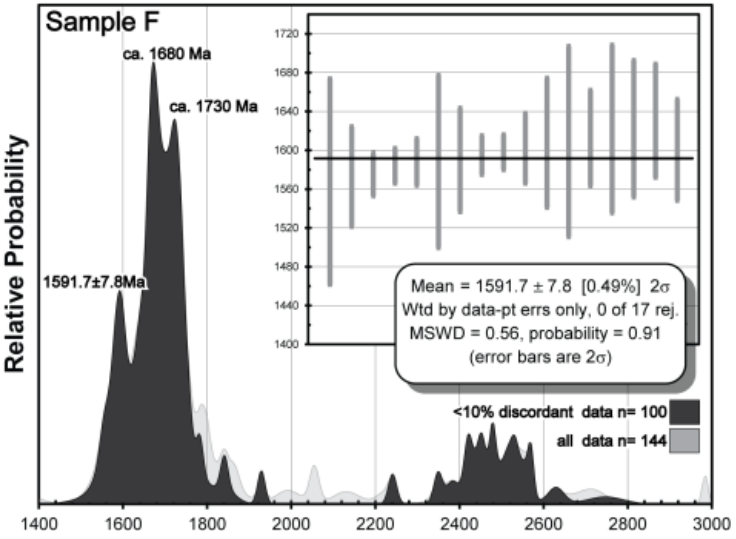
Introduction

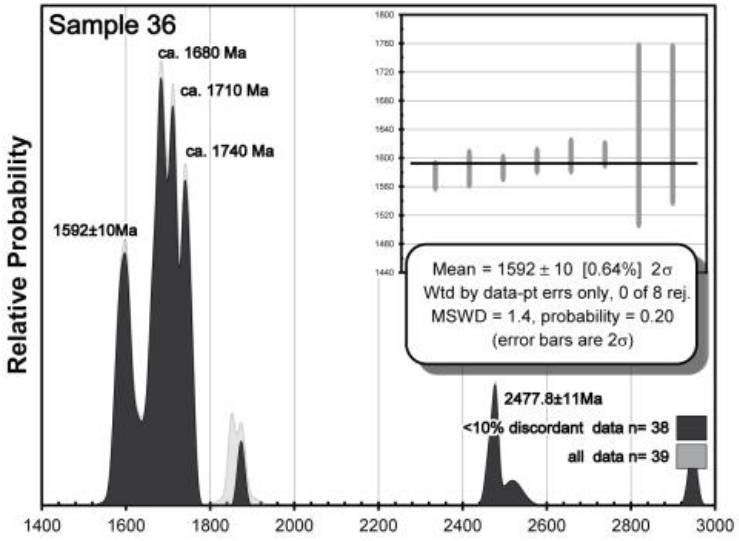


U-Pb-Hf isotopes



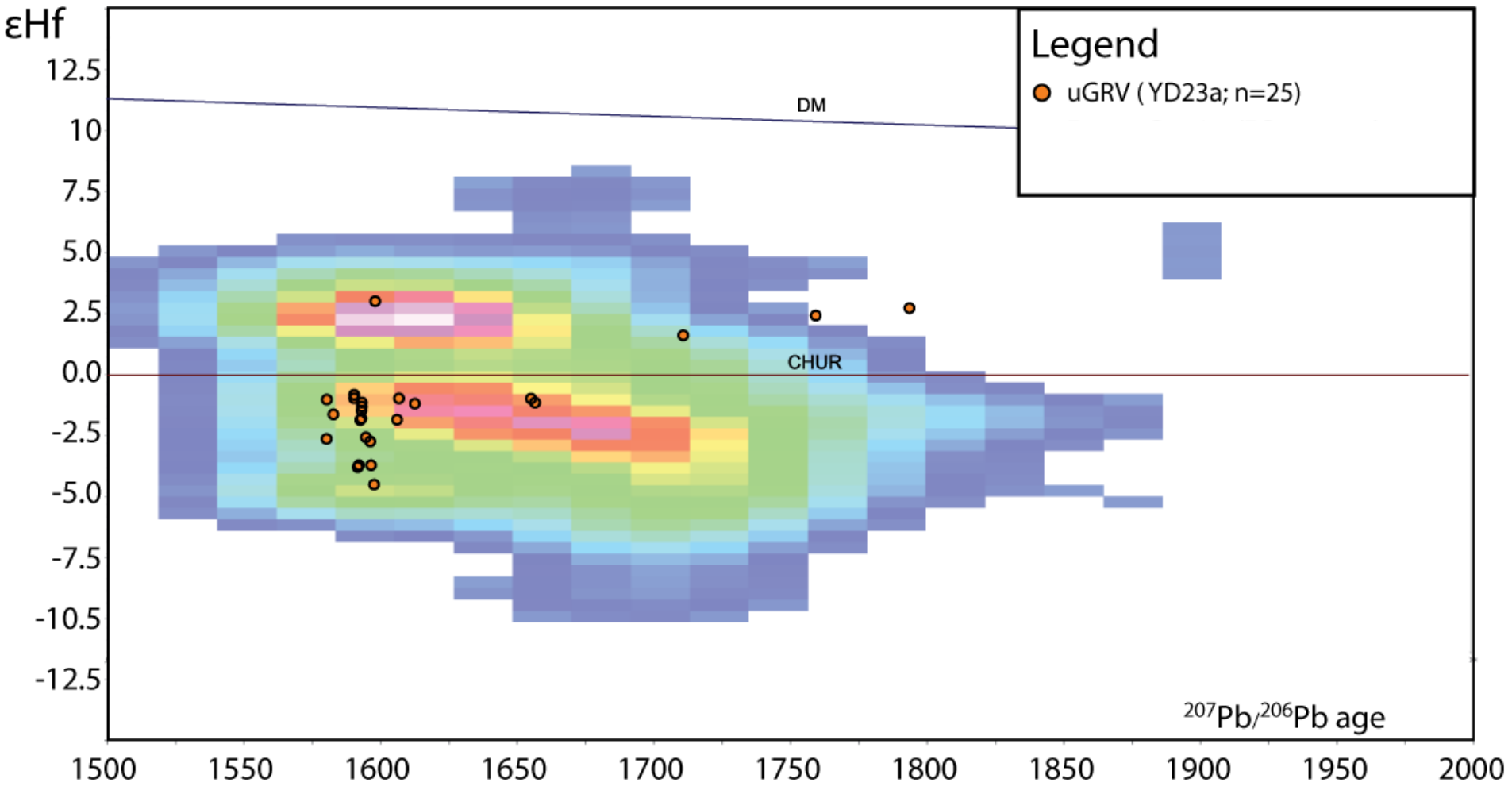






Armit et al., 2014 (Precambrian Research 243, p 63-87)

U-Pb-Hf isotopes



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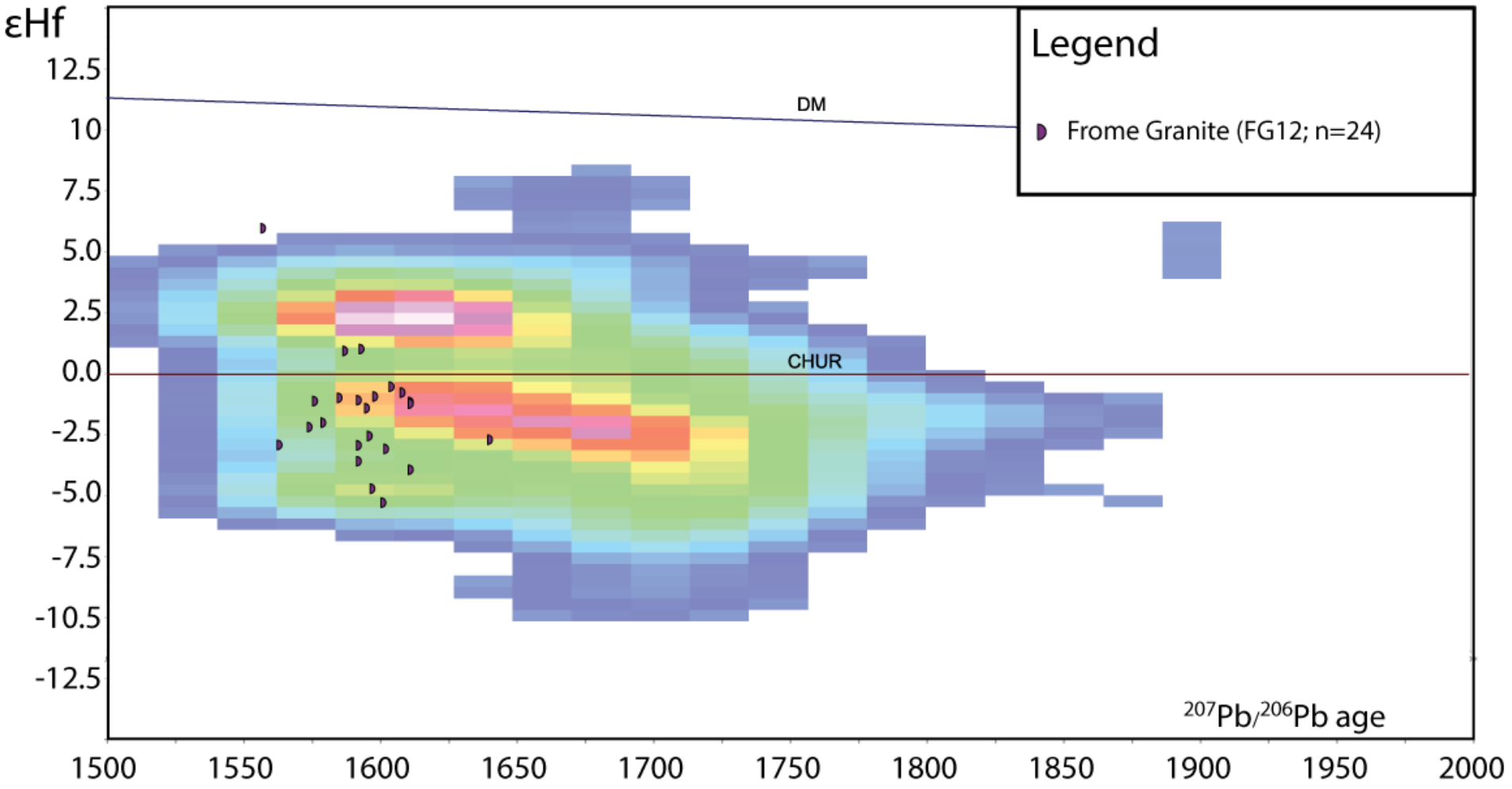

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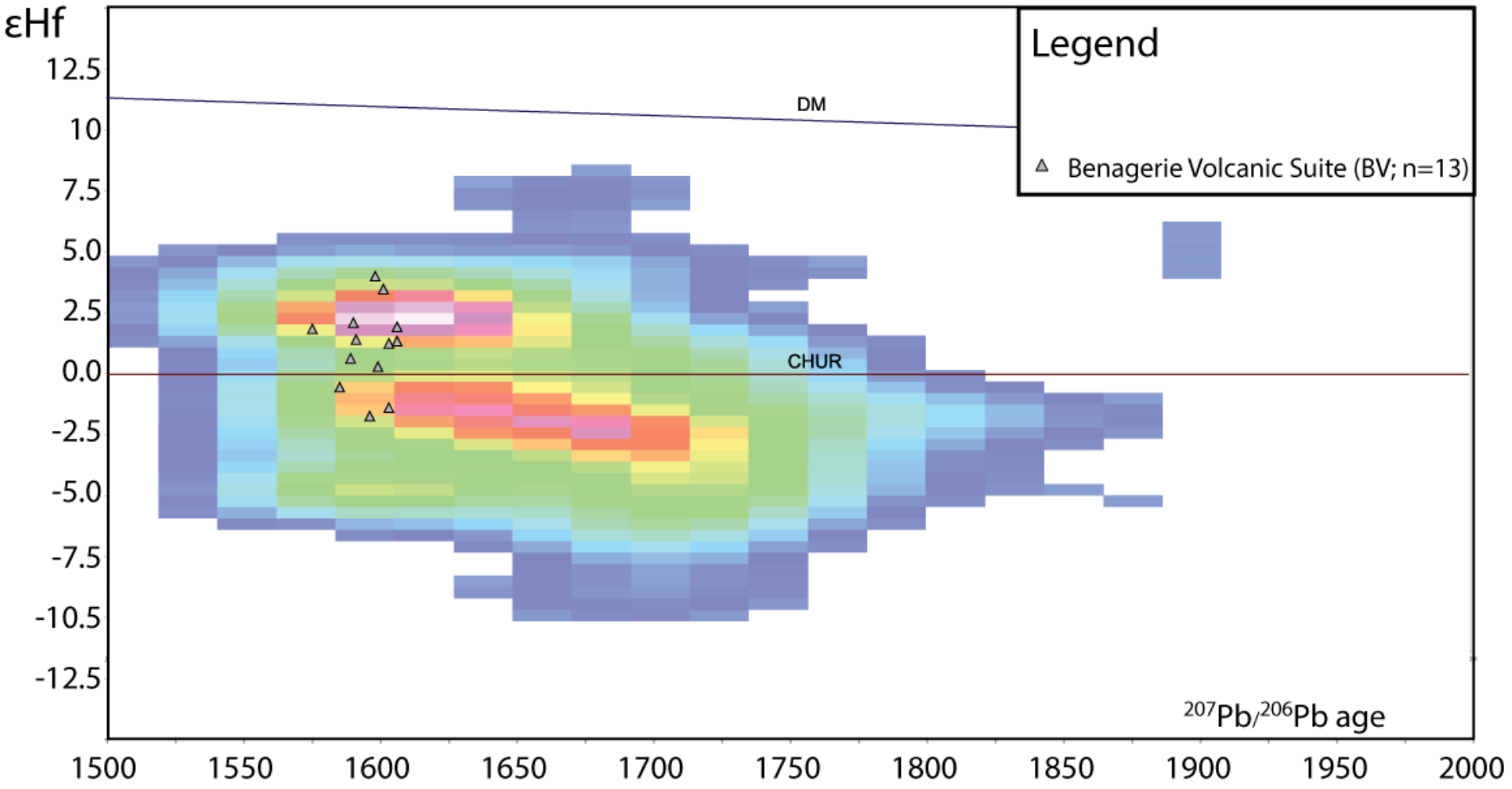

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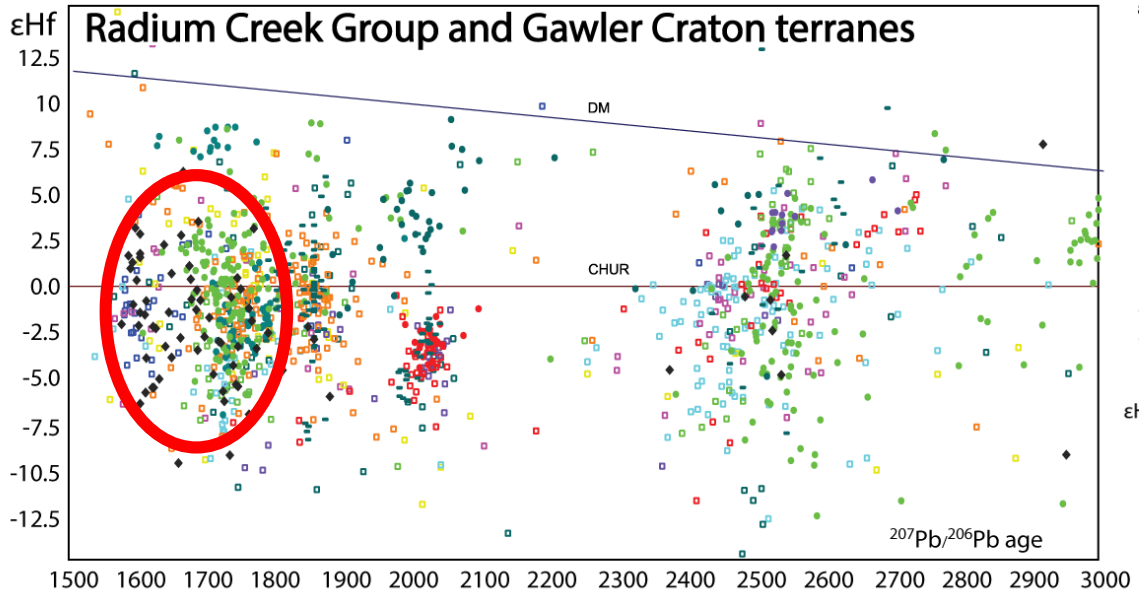
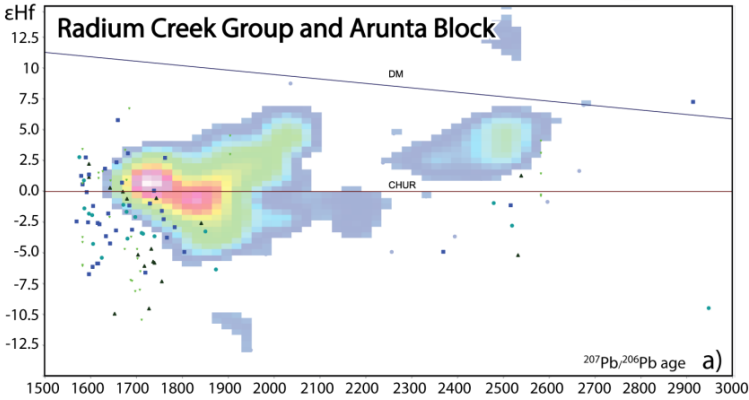
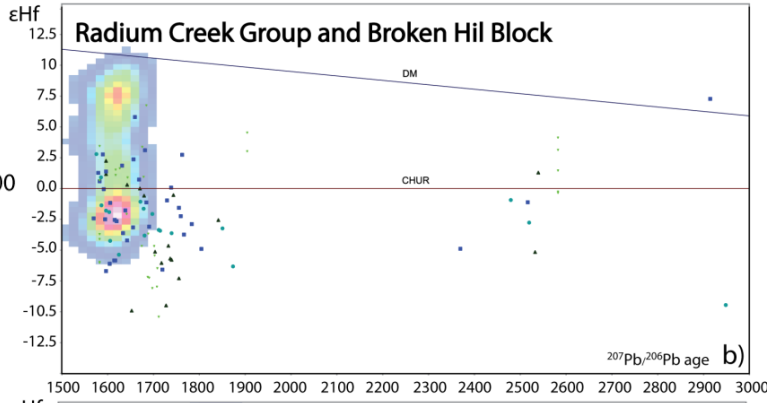
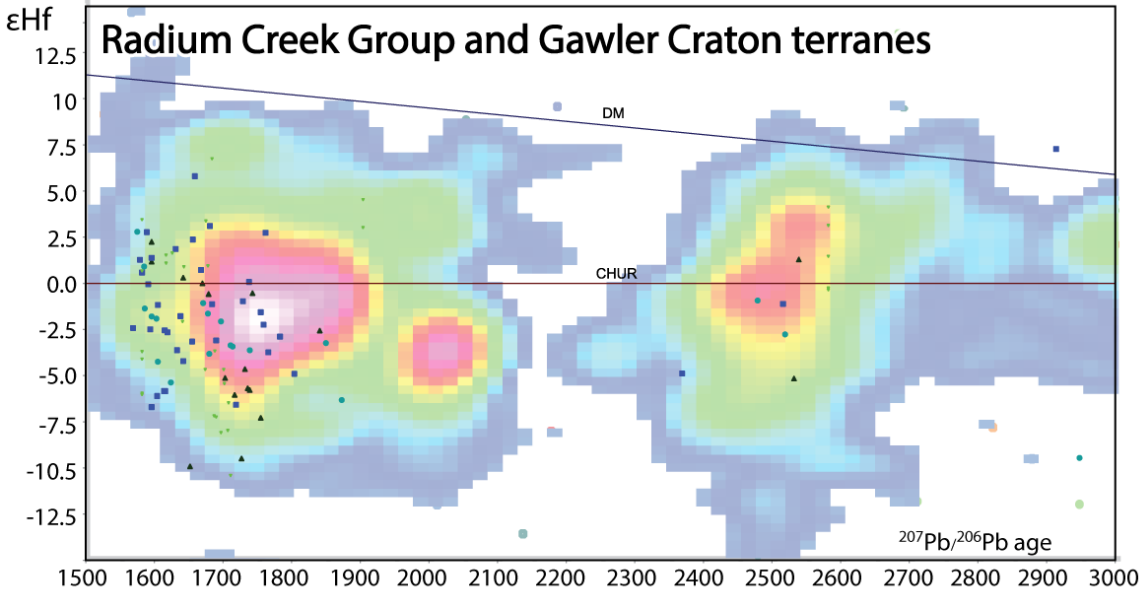
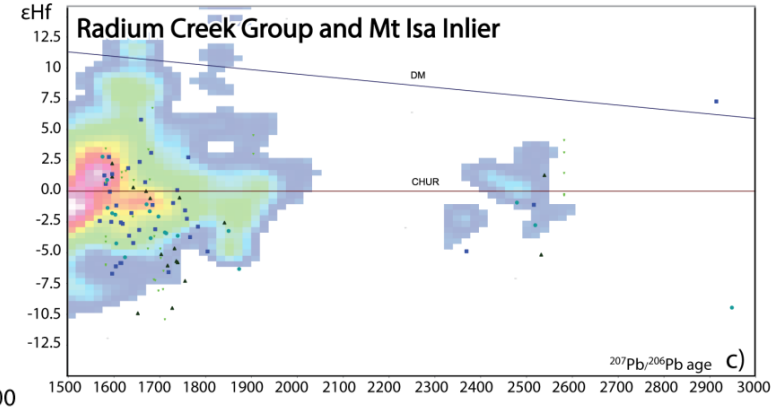




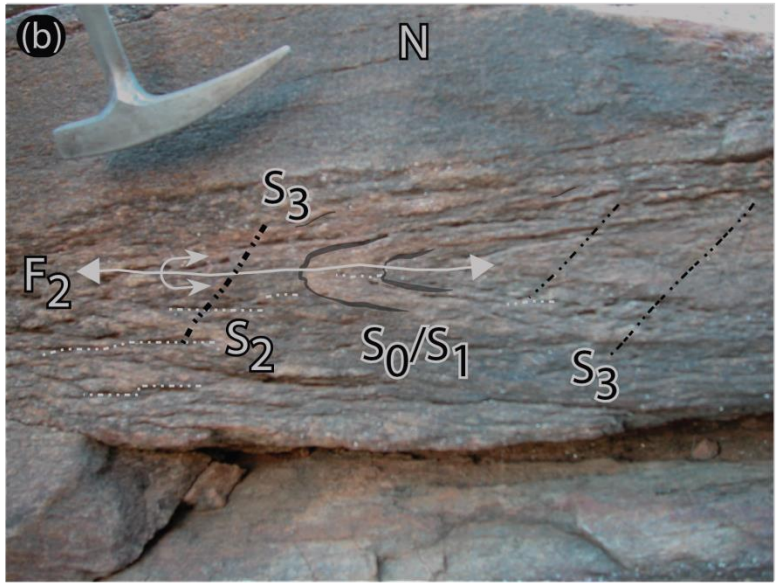






Structural evolution

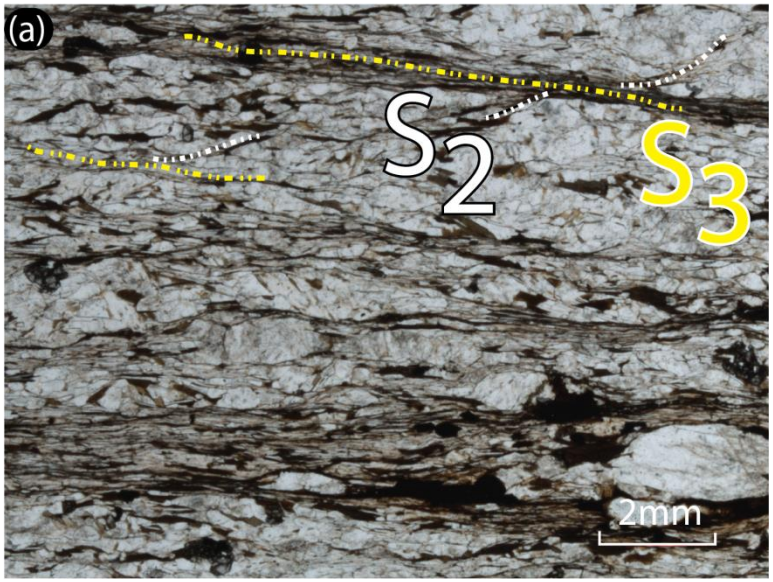
- D_1- unresolved geometry, layer parallel mineral-defined S_1.
- D_2 – N-verging, Shallowly inclined to recumbent, very tight to isoclinal F_2.
- S_2 – Defined by peak metamorphic (M_2) assemblages (upper amphibolite facies).
- S_1/S_2 are overprinted by the shallowly emplaced 1585-1569Ma Mount Neill Granite and S_3.

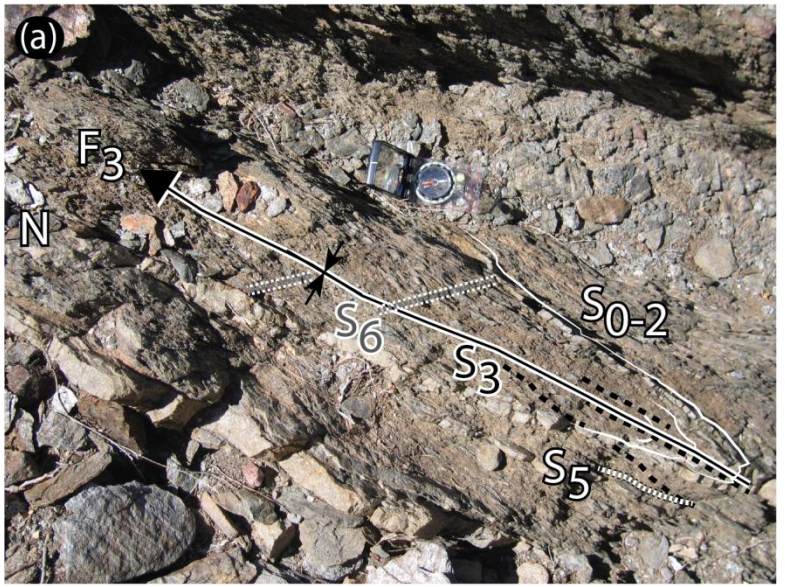


Armit et al., 2012 (Gondwana Research 22, p.207-226)

D_3 1569-1552 Ma

- Upright to steeply inclined, shallow NE-SW double-plunging tight F_3, trending NE-SW.
- S_3 defined by musc ± bt foliation (M_3).
- S_3 fabric overprints the 1585-1569 Ma Mount Neill Granite but not ca. 1560 Ma Moolawatana Suite and ca. 1552 Ma Hodgkinson Granodiorite.
- Ca. 1555 Ma zircon overgrowths attributed to M_3.

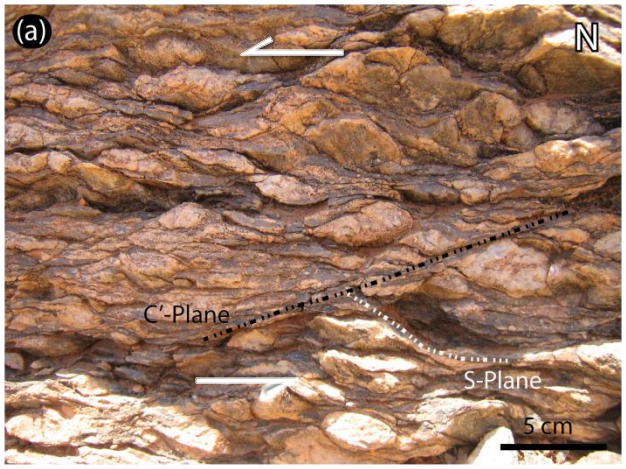


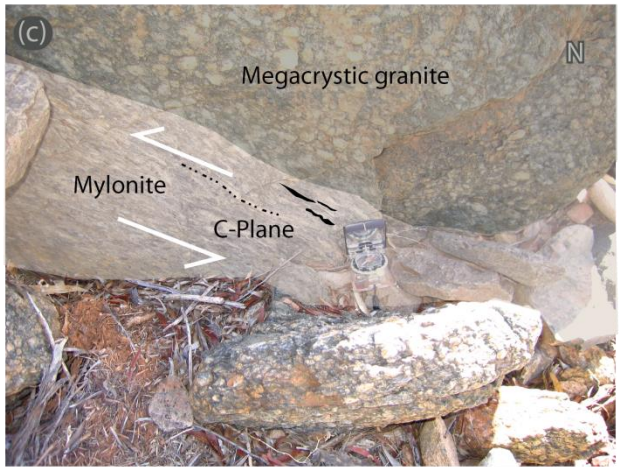


Late D_3 shearing

- D_3 related shearing along the Paralana Fault is constrained to a ductile, sinistral transpressive regime.

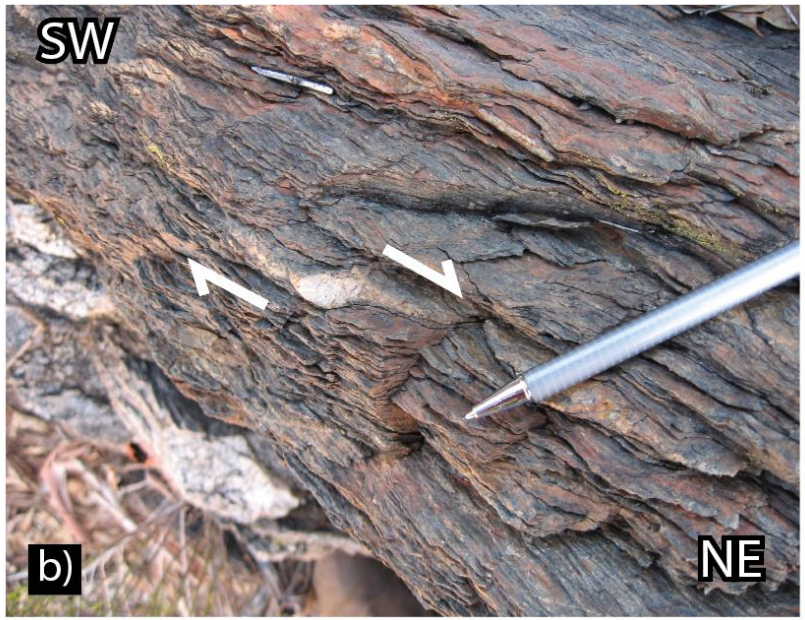
- Late D_3 shearing affects the ca. 1560 Ma Moolawatana Suite and ca. 1552 Ma Hodgkinson Granidiorite.

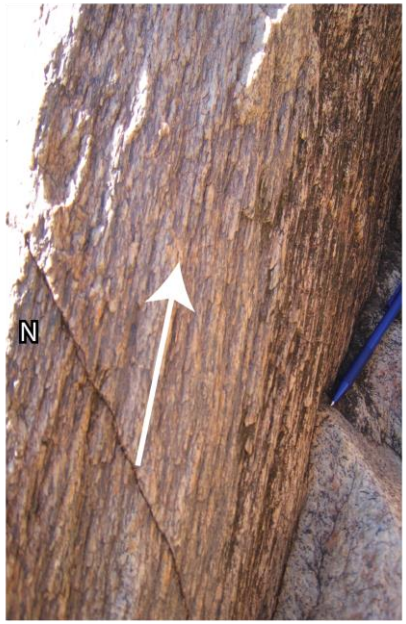


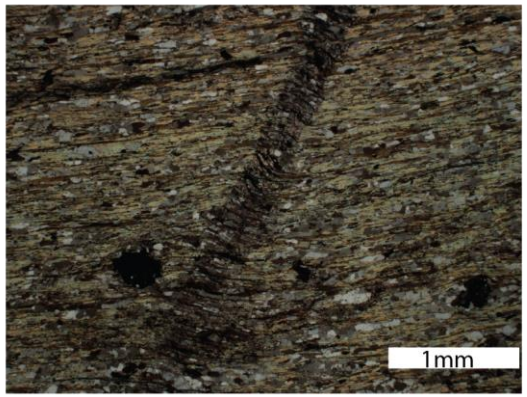


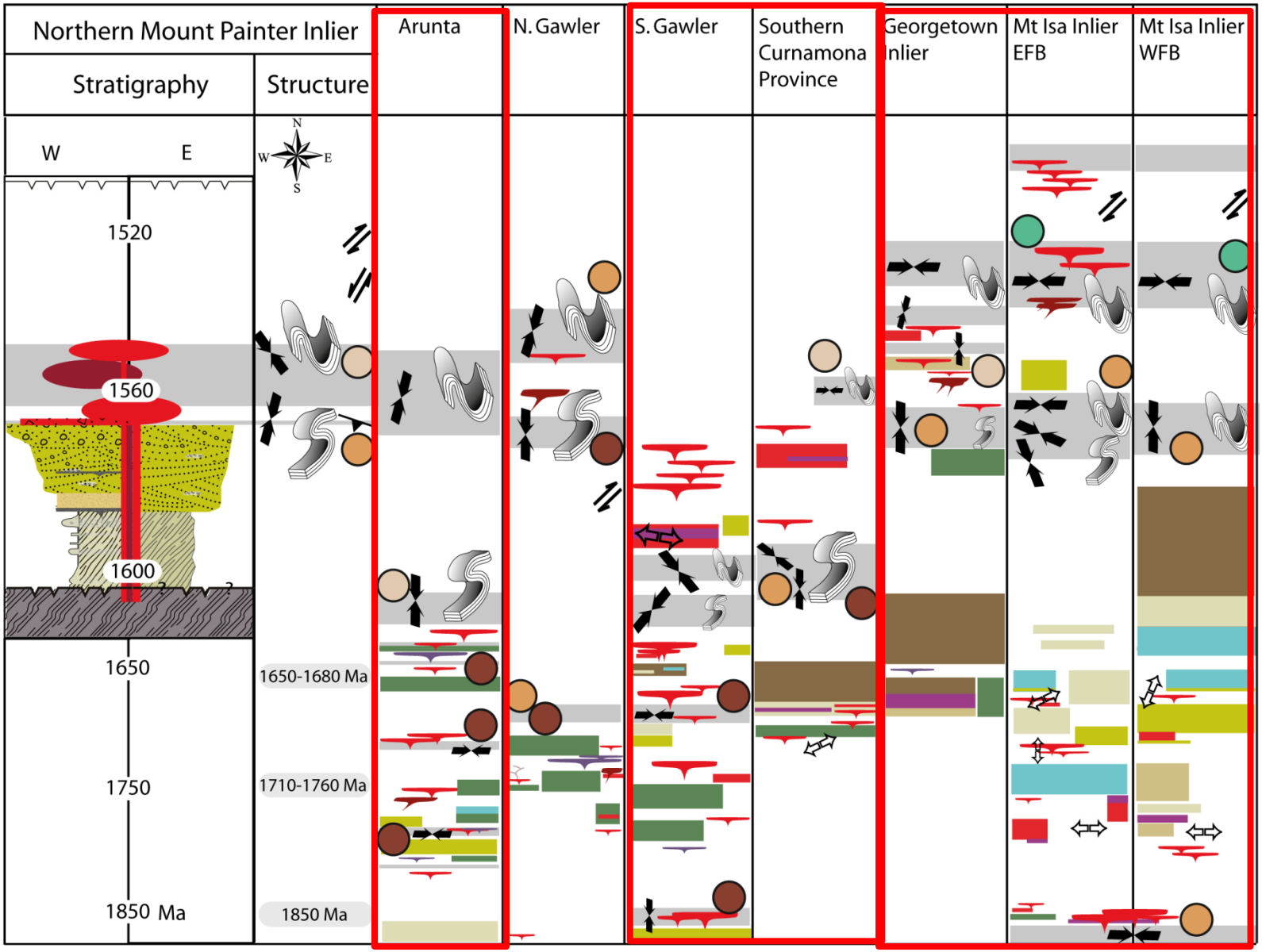
Neoproterozoic and Phanerozoic deformation

- Transtensional D_4.
- NW-SE directed D_5 tightens F_3 structures.
- Open, upright, shallow doubly plunging F_5.
- F_6 very open folds warping the S_0-S_5 fabrics.
- Brittle reactivation along N-S segments of the Paralana Fault.



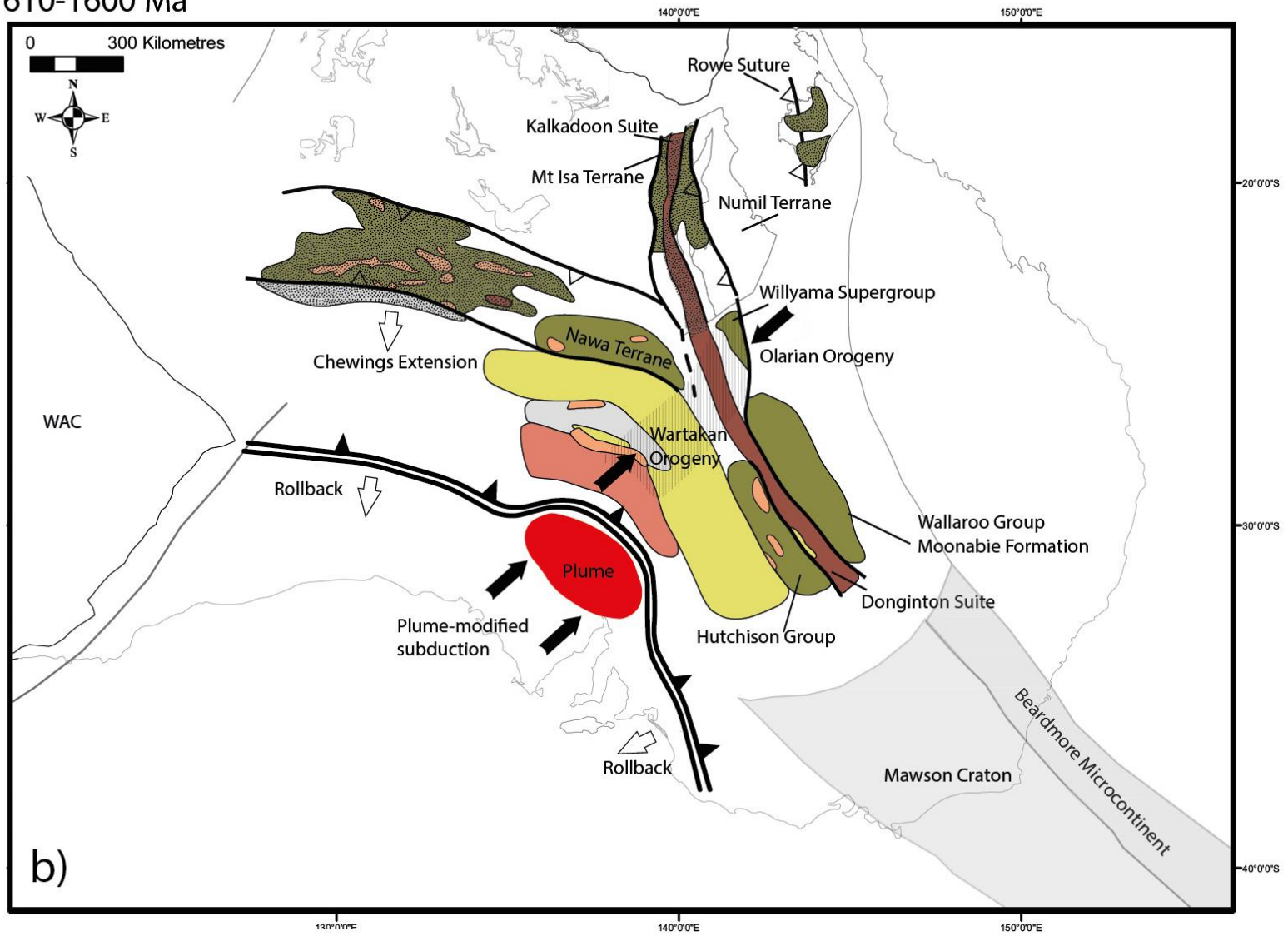





Northern Mount Painter Inlier
Stratigraphy
Structure
W
E
1520
1560
1600
1650
1750
1850 Ma
1650-1680 Ma
1710-1760 Ma
1850 Ma
Arunta
N. Gawler
S. Gawler
Southern Curnamona Province
Georgetown Inlier
Mt Isa Inlier EFB
Mt Isa Inlier WFB
Legend
Felsic intrusive
Mafic intrusive
TTG type intrusive
Felsic volcanic/porphyry
Mafic volcanic
Metamorphic complex
Carbonaceous sediment
Fine-grained clastic sediment
Medium-grained clastic sediment
Course-grained clastic sediment
Carbonate sediment
Relative timespan of orogeny
Granulite facies metamorphism
Amphibolite facies metamorphism
Retrogreade amphibolite facies metamorphism
Greenschist facies metamorphism

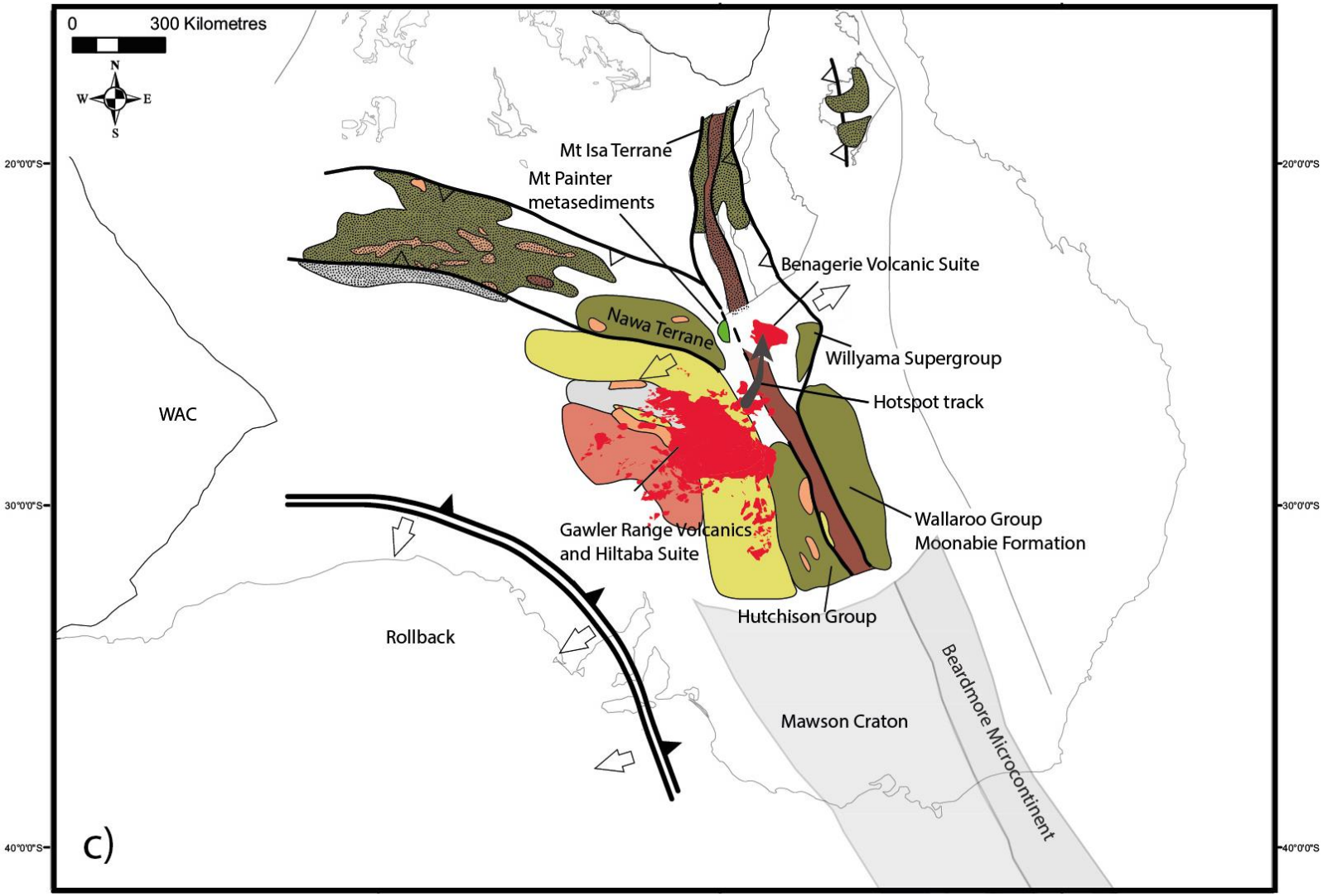
Mesoproterozoic reconstruction space

Ca 1610-1600 Ma



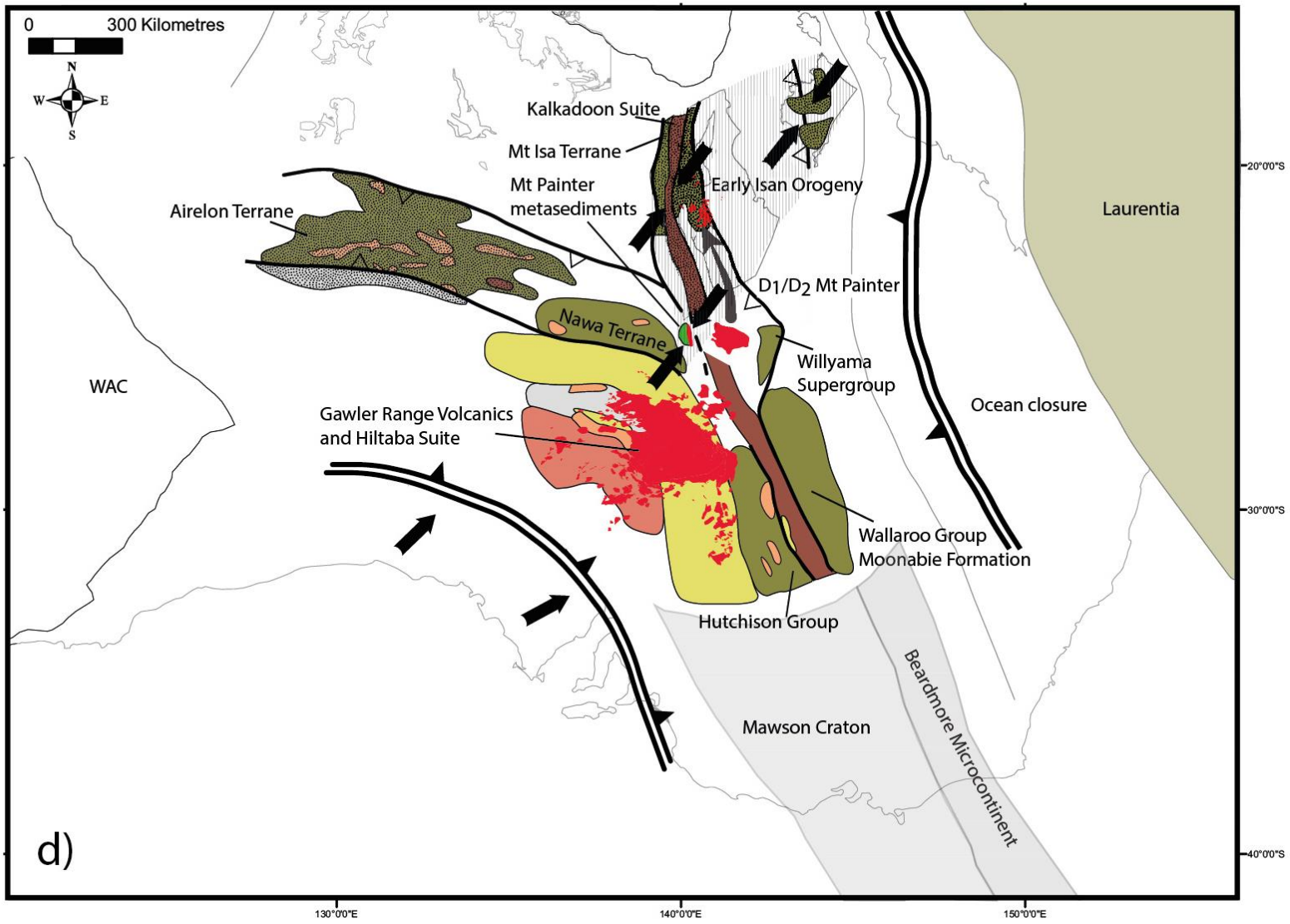
Mesoproterozoic reconstruction space

Ca 1595-1590 Ma



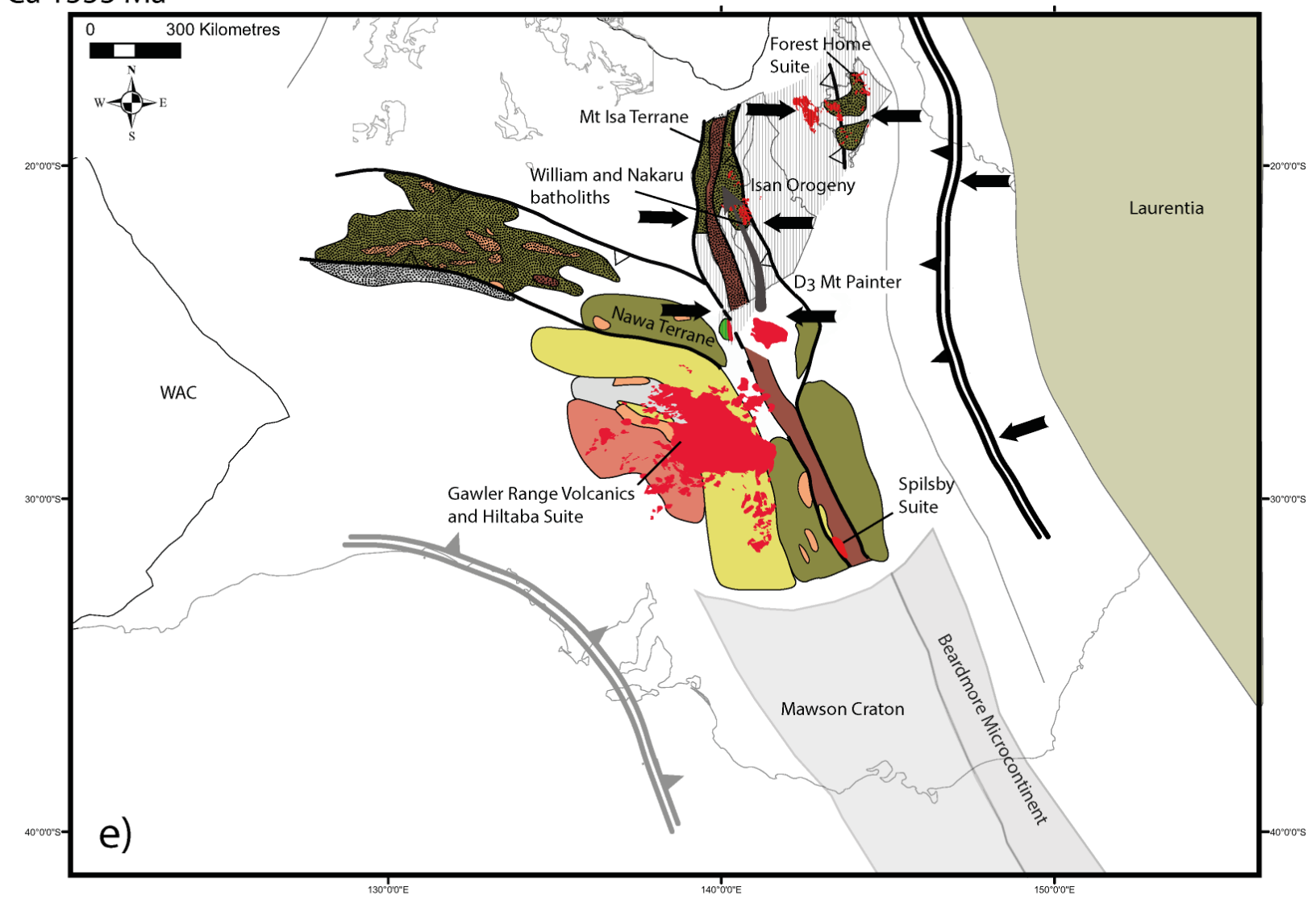
Mesoproterozoic reconstruction space

Ca 1585 Ma



Mesoproterozoic reconstruction space

Ca 1555 Ma



Conclusions

- Radium Creek Group zircon U-Pb-Hf signatures:
- Deposited in a one basin-forming phase at ~1595 Ma.
- Detrital zircon similar to the Gawler Craton.
- Early Mesoproterozoic deformation events record rapid tectonic switches between ~1595 & 1555 Ma.
- These events similar times to those recorded in the northern Gawler Craton, Etheridge Province and Mount Isa Inlier.
- Distinct from the ~1620-1590 Ma Olarian-Wartaken orogenic in the SAC.
- Tectonic framework suggests that the Mount Painter Province is an Early Mesoproterozoic highly reworked zone at the nexus of two plate margins.