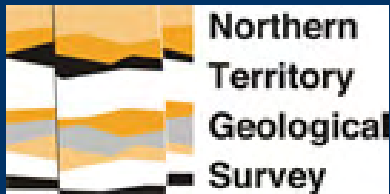




Australian Government
Geoscience Australia

Pine Creek Orogen: a synthesis through time and space

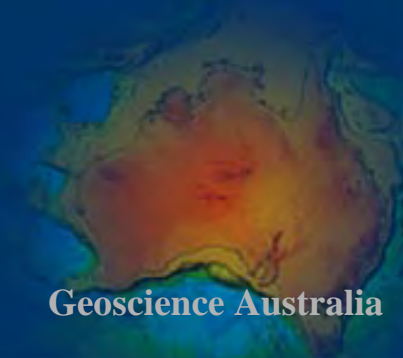


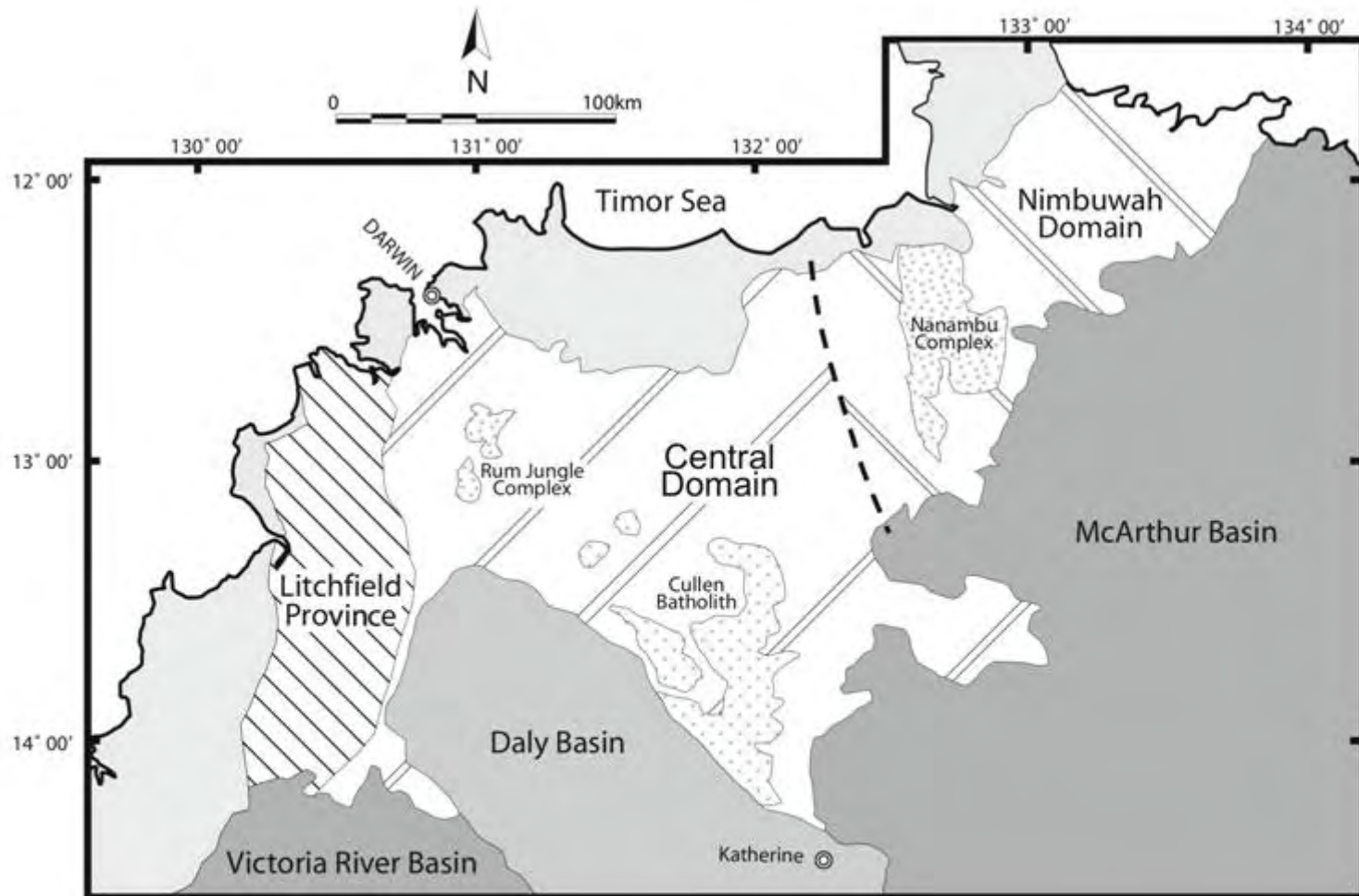
Kurt Worden
Geoscience Australia
Evolution and Metallogensis of the NAC
ALICE SPRINGS, 20-22 JUNE 2006




Outline

- **Introduction**
- **Geological framework**
- **Geochronological constraints**
- **From lithostratigraphy to chronostratigraphy**
- **Regional correlations**
- **Conclusions**







Mesozoic


 Bathurst Terrace and Bonaparte Basin

Palaeozoic


 Daly River Basin

Proterozoic

 McArthur and Victoria Basin

 Cullen Batholith

Archaean

 Rum Jungle Complex
Nanambu Complex

LITCHFIELD PROVINCE

CENTRAL DOMAIN

NIMBUWAH DOMAIN

West

East

undifferentiated post-tectonic platform cover

SHOOBRIDGE TECTONO-METAMORPHISM

EDITH RIVER GROUP	Plum Tree Crk Volc.
	Phillips Crk Sst
	Kurundie Sst
	Hindrance Crk Sst

EL SHERANA GROUP	Big Sunday Sst
	Pul Pul Rhyolite
	Coronation Sst

Cullen Batholith

Litchfield Granitoids

Wangi Basics

Zamu Dolerite

Ranger Pegmatite

Nimbuwah Granitoids

Hermit Creek Metamorphics
Welltree Metamorphics
Fog Bay Metamorphics

FINNISS RIVER GROUP

Chilling Sandstone

Tollis Formation

Burrell Creek Formation

Meeway Vol. Mulluk Mulluk Vol. Member Warrs Vol. Member Berinka Vol.

SOUTH ALLIGATOR GROUP

Mount Bonnie Formation

Gerowie Tuff

Koolpin Formation

MOUNT PARTRIDGE GROUP

Acacia Gap Quartzite Member

Wildman Siltstone

Whites Formation

Coomalie Dolostone

Koolpinyah Dolostone

Crater Formation

Mundogie Sandstone

Nourlangie Schist

Myra Falls Metamorphics

MANTON GROUP

Celia Dolostone

Beeston's Formation

NAMOONA GROUP

Stag Creek Volcanics

Masson Formation

Rum Jungle Complex

Woolner Granite

Stanley and Dirty Water Metamorphics

Nanambu Complex

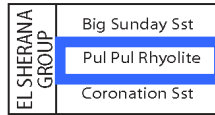
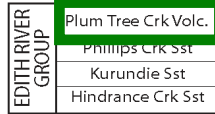
GEOLOGICAL FRAMEWORK

- Basement
- Stratigraphy
 - correlations
 - confusions
- Mafic intrusives, granitoids and migmatites
- Metamorphism
- Deformation

LITCHFIELD PROVINCE West CENTRAL DOMAIN NIMBUWAH DOMAIN East

undifferentiated post-tectonic platform cover

SHOOBRIDGE TECTONO-METAMORPHISM



TECTONO-METAMORPHISM



Wangi Basics

Zamu Dolerite

Ranger Pegmatite



Hermit Creek Metamorphics
Welltree Metamorphics
Fog Bay Metamorphics

FINNISS RIVER GROUP

Chilling Sandstone

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Mulluk Mulluk Vol. Member

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Stag Creek Volcanics

Rum Jungle Complex
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Stanley and Dirty Water Metamorphics

Nanambu Complex

RECENT GEOCHRONOLOGY

Plum Tree Creek Volcanics

Pul Pul Rhyolite

Post-orogenic Ranger pegmatite

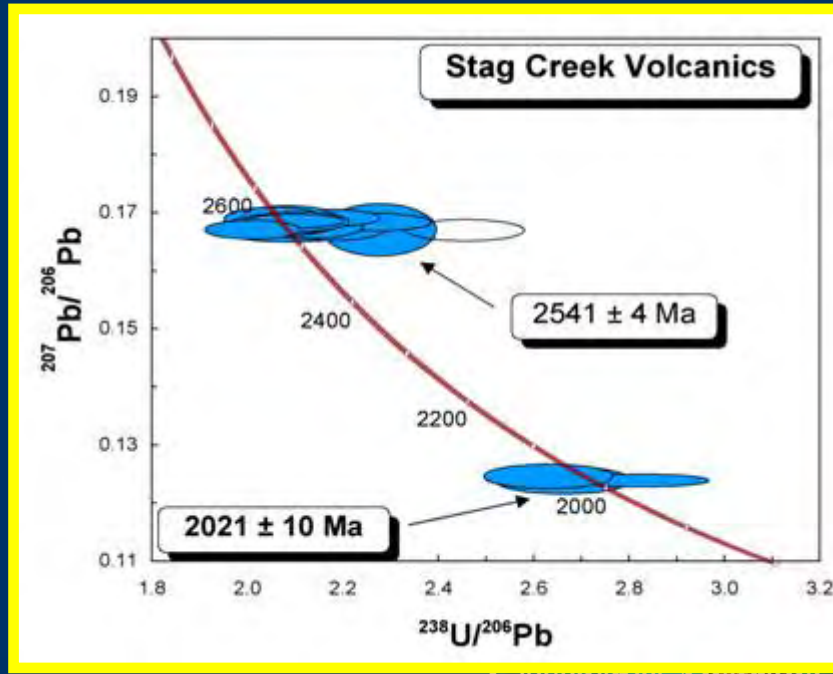
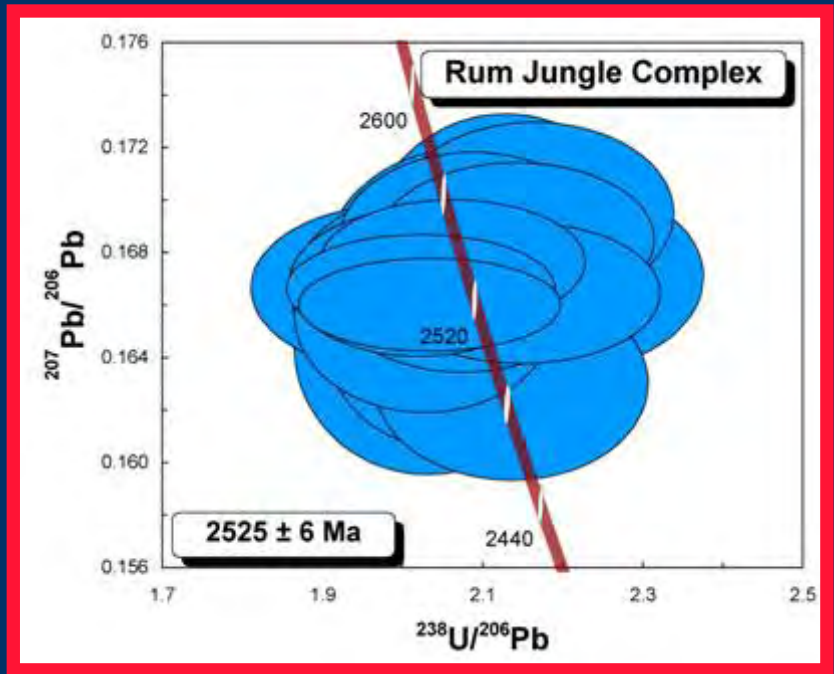
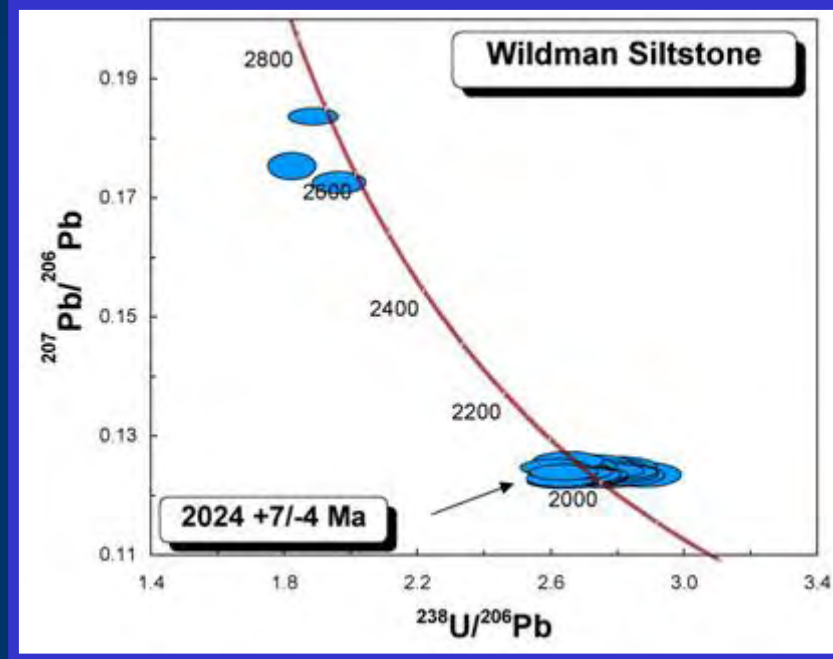
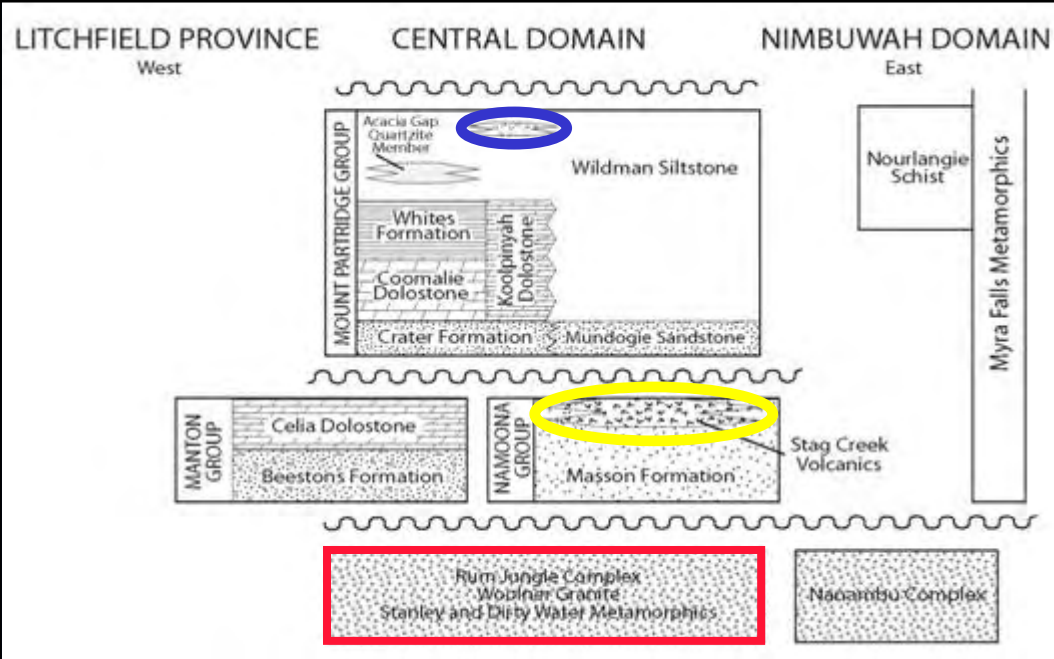
**Warrs Volcanic Member,
Berinka Volcanics, Fog Bay
Metamorphics**

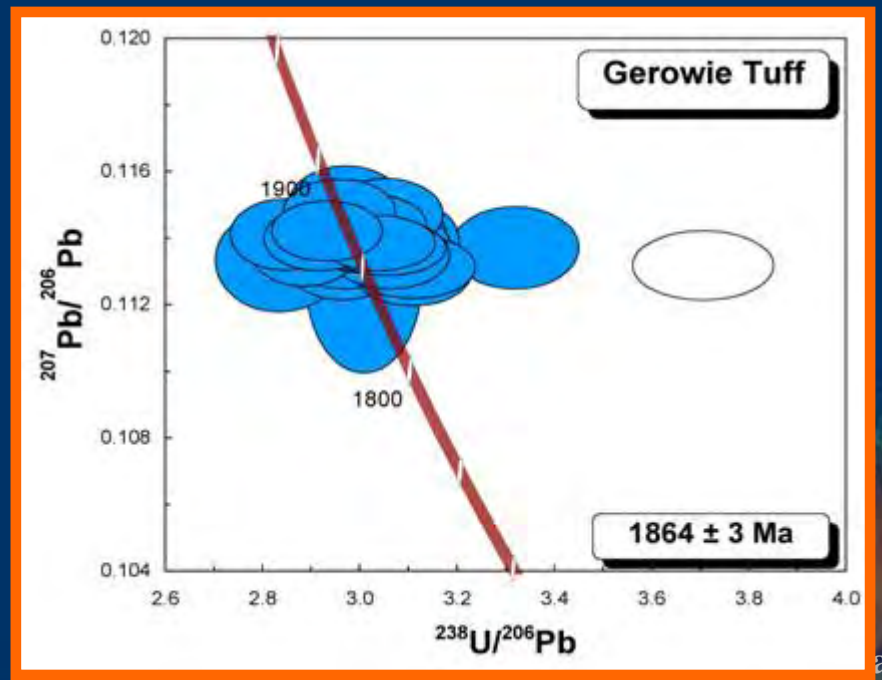
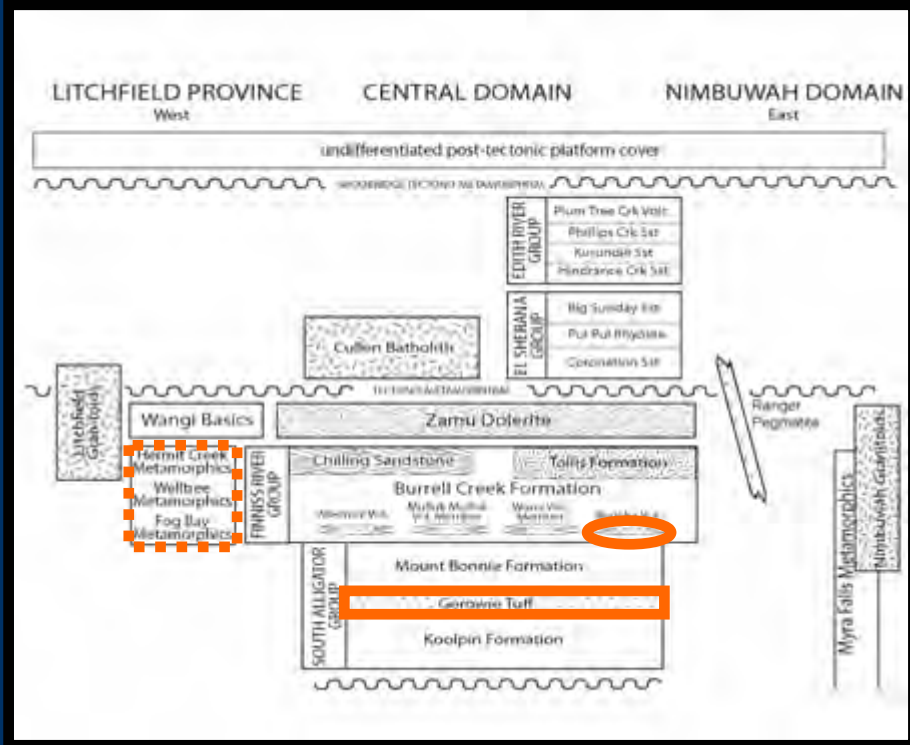
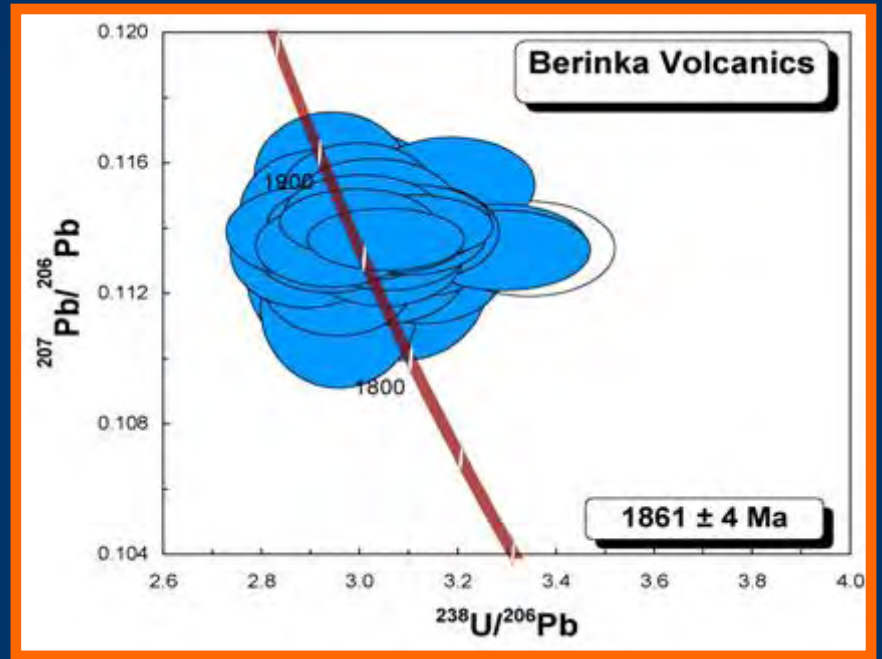
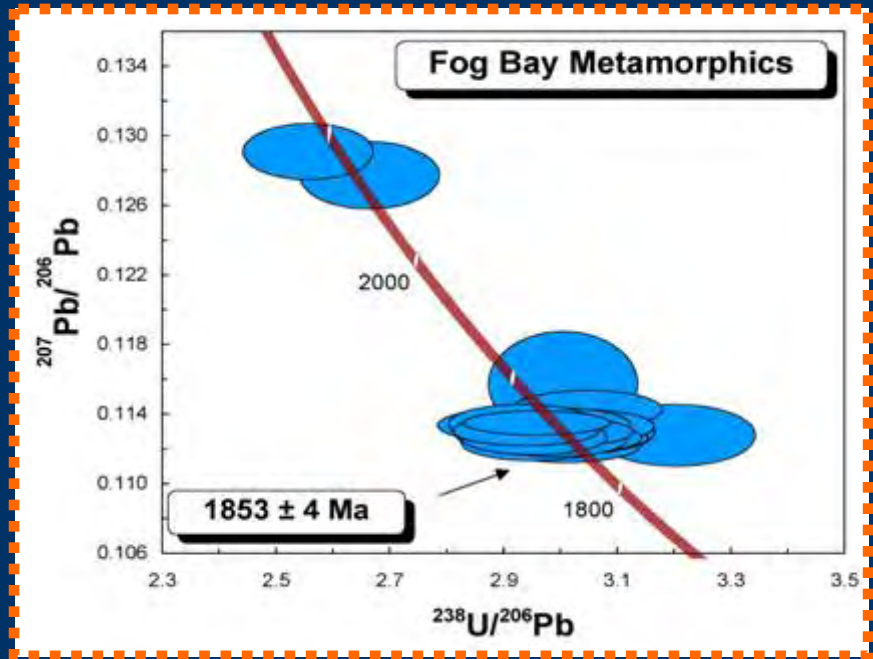
Gerowie Tuff

**Wildman Siltstone
(tuffaceous sediment)**

Stag Creek Volcanics

Rum Jungle Complex





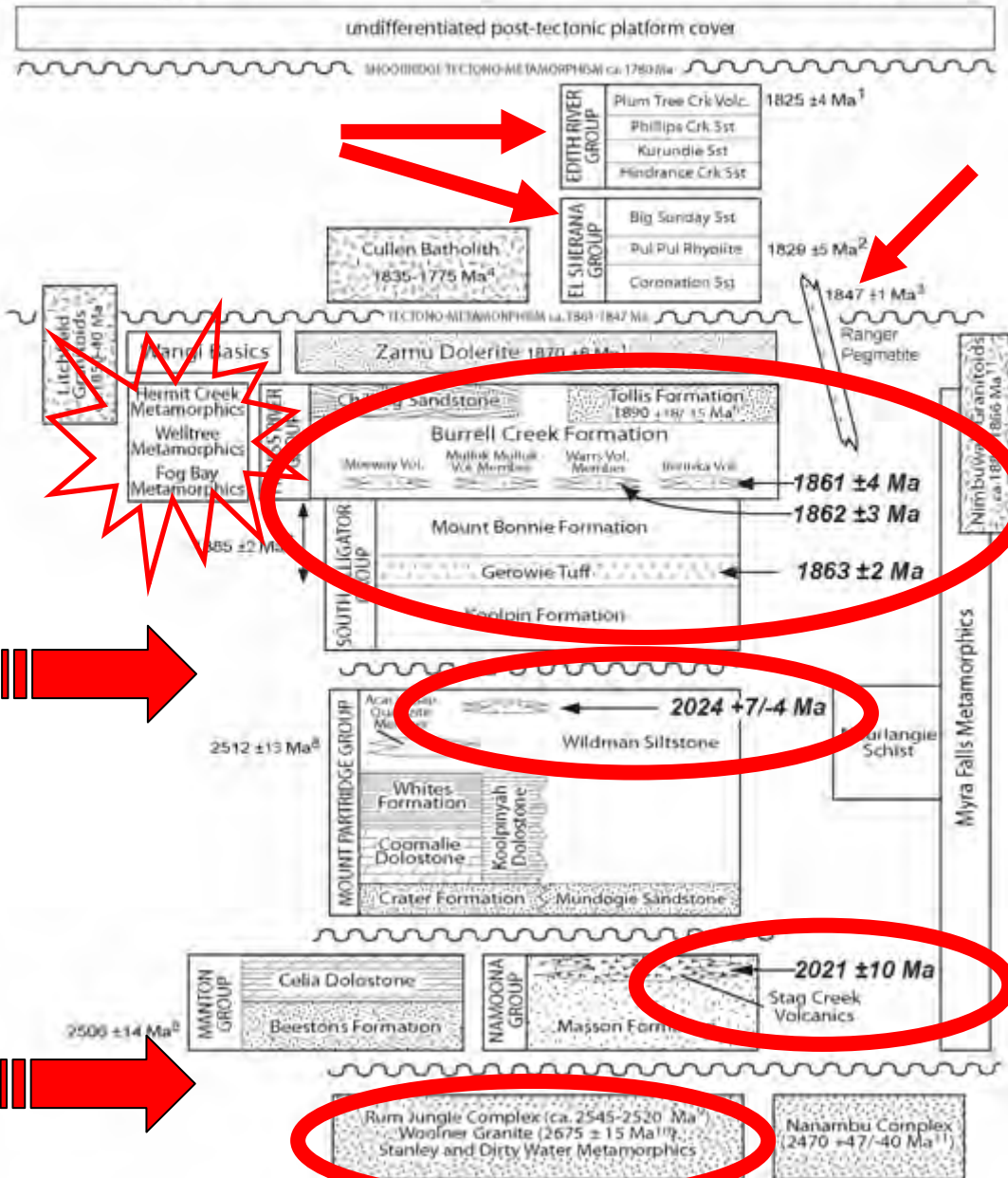
LITCHFIELD PROVINCE

West

CENTRAL DOMAIN

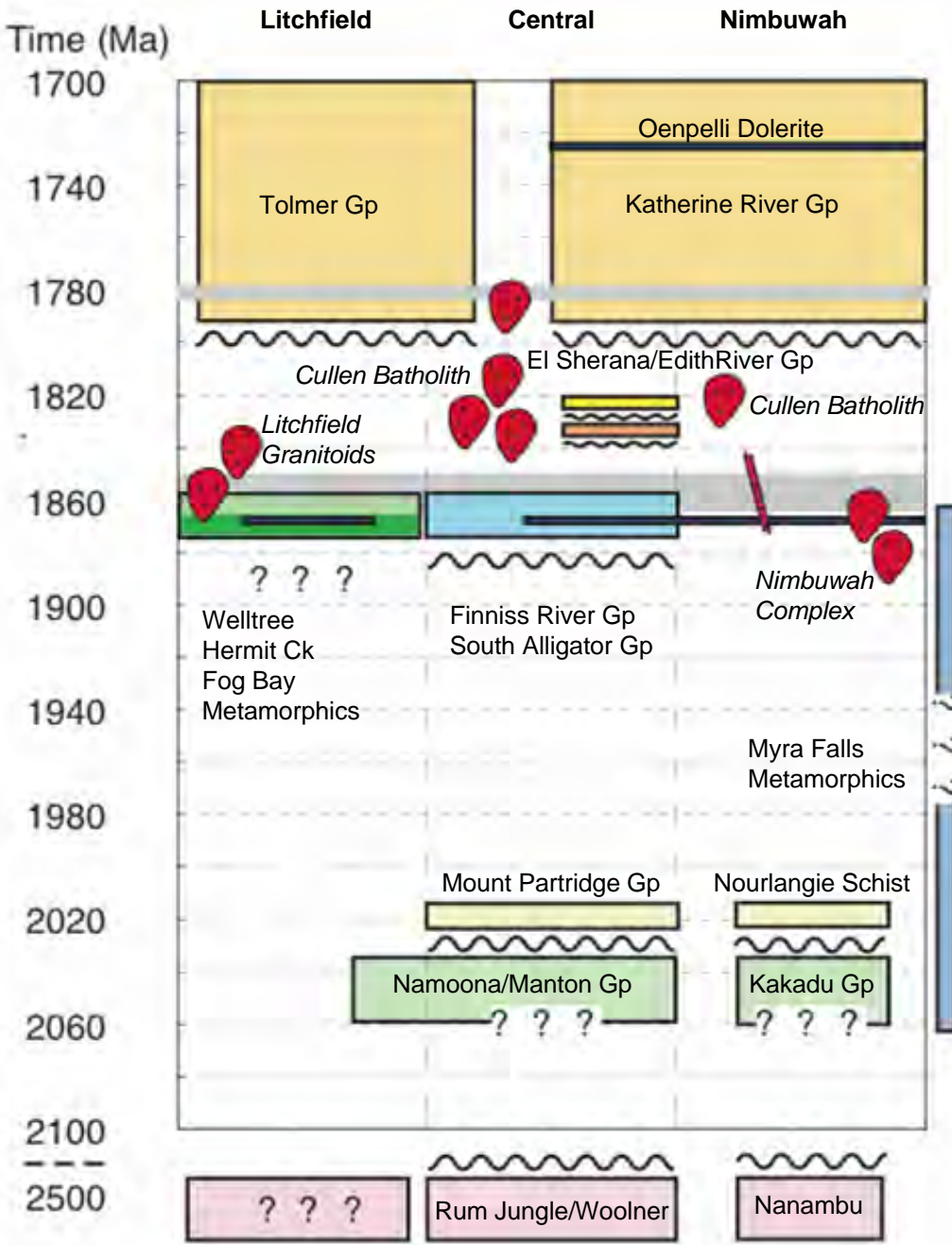
NIMBUWAH DOMAIN

East



RESULTS AND IMPLICATIONS

- Extension and deposition ca. 1830 Ma onwards
- Deformation over by ca. 1847 Ma
- Peak metamorphism ca. 1855 Ma
- Rapid deposition and felsic volcanism at ca. 1863 Ma
- Significant time/stratigraphic break - up to 150 Ma
- Mount Partridge Group is constrained at ca. 2024 Ma
- Initial rifting occurred prior to ca. 2050-2020 Ma
- Neoproterozoic basement ca. 2545 - 2520 Ma



TIME-SPACE EVOLUTION:
2550 - 1700 Ma

Previous Model

NAPWRAP Concept

■ **'Pre-orogenic phase'**
■ **'Sag phase'**

■ **Phase 2**
■ **Phase 1**

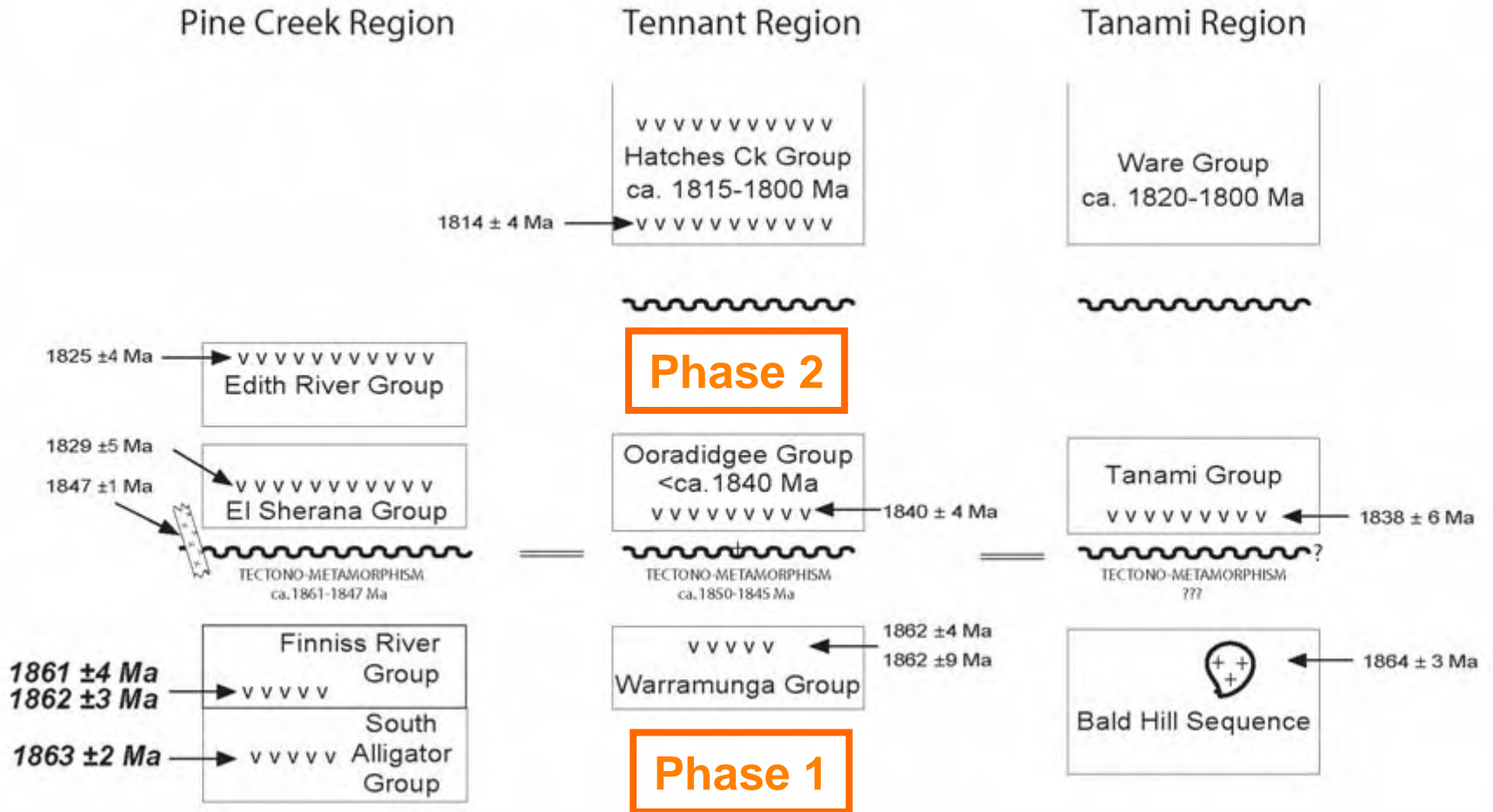
■ **'Rift phase'**

■ **Phase 0**
■ **Phase -1**

■ **Basement**

■ **Basement**

Regional Correlations



Ongoing and Future Work

- **Nimbuwah: Monazite to establish peak metamorphism**
- **Central: zircon/baddeleyite from Zamu Dolerite, Tollis Fm, Burrell Creek Fm provenance**
- **Litchfield: Granitoid ages, Wangi Basics, Hermit Creek Metamorphics provenance**



Conclusions

- **Recent geochronology offers new constraints on evolution of the Pine Creek Orogen**
- **These constraints may be placed in a time-space framework to depict periods of activity and quiescence**
- **The time-space framework allows inter-regional comparisons and correlations: eg with Tanami and Tennant Regions, Halls Creek Orogen**

Questions for Agro?

1 m

A photograph of a crocodile in a river. The crocodile is dark and has a bumpy, scaly texture. It is positioned horizontally across the middle of the frame, with its head on the left and tail on the right. The water is a muddy brown color. In the background, there is a rocky bank with some sparse vegetation. A white rectangular box with a yellow border is overlaid on the image, containing the text "1 m" and a horizontal orange line below it, indicating the scale of the crocodile.