



# **Geology of Neoproterozoic to Cambrian**

## **Adelaide Geosyncline and Cambrian Delamerian Orogen**

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- Link line traverses Flinders Ranges to join western end of E-W Curnamona line
- Primary aim to establish relationship between Gawler Craton and Curnamona Province
- New stratigraphic and structural information on Neoproterozoic and Cambrian cover of the Adelaide Geosyncline
- Adelaide Geosyncline is a complex of rift and sag basins related to break-up of Rodinia during the Neoproterozoic
- Great thickness of cover succession has long been known from surface mapping, >>10 km
- Exact thickness hard to estimate because of great variation in thickness of individual sediment packages and
- Because base of succession exposed only in a few places near basin margin, not in depocentres



- Depositional history is recorded in generally well-exposed and understood stratigraphy
- Chronostratigraphic units defined by Mawson and Sprigg, together with the Cambrian and recently ratified Ediacaran, provide a broad time framework
- Lithostratigraphic subdivision and classification has evolved since turn of 20<sup>th</sup> century
- Unconformities/sequence boundaries are important in Neoproterozoic lithostratigraphy:
  - *to define discrete episodes of sedimentation*
  - *to aid correlation of sediment packages*
  - *to understand lateral and vertical facies changes within those packages*



Chronostratigraphy		SUPERGROUP	GROUP	SUBGROUP
<i>CAMBRIAN</i> ~540 Ma				
	<i>EDIACARAN</i>			
	<i>MARINOAN</i>			
	<i>STURTIAN</i> ~660 Ma			
	<i>TORRENSIAN</i> ~790 Ma			
	<i>WILLOURAN</i> ~830 Ma			



Chronostratigraphy		SUPERGROUP	GROUP	SUBGROUP
<i>CAMBRIAN</i> ~540 Ma		Moralana		
	<i>EDIACARAN</i>	Heysen		
	<i>MARINOAN</i>			
	<i>STURTIAN</i> ~660 Ma	Warrina		
	<i>TORRENSIAN</i> ~790 Ma			
	<i>WILLOURAN</i> ~830 Ma			



Chronostratigraphy		SUPERGROUP	GROUP	SUBGROUP
<i>CAMBRIAN</i> ~540 Ma		Moralana	Lake Frome	
			unnamed	
			Hawker	
	<i>EDIACARAN</i>	Heysen	Wilpena	
	<i>MARINOAN</i>		Umberatana	
	<i>STURTIAN</i> ~660 Ma	Warrina		
	<i>TORRENSIAN</i> ~790 Ma		Burra	
	<i>WILLOURAN</i> ~830 Ma		Callanna	





Chronostratigraphy		SUPERGROUP	GROUP	SUBGROUP	
<i>CAMBRIAN</i> ~540 Ma		Moralana	Lake Frome		
			unnamed		
			Hawker		
	<i>EDIACARAN</i>	Heysen	Wilpena	Pound	
				unnamed	
				Sandison	
<i>MARINOAN</i>			Umberatana	Yerelina	
				Upalinna	
<i>STURTIAN</i> ~660 Ma				Nepouie	
					Yudnamutana
<i>TORRENSIAN</i> ~790 Ma			Warrina	Burra	Belair
					Bungarider
					Mundallio
					Emeroo
<i>WILLOURAN</i> ~830 Ma				Callanna	Curdimurka
					Arkaroola



# Sedimentation summary

Redbed and shallow marine mature sand;  
Ediacara fauna

Marine shelf sedimentation; bolide impact,  
submarine canyons

Marine transgression-regression

Aeolian, fluvio-glacial and glaciomarine  
sedimentation; Elatina glaciation

Paralic to shallow marine basin, red and  
green beds

Marine transgression-regression; reefs

Renewed rifting; Sturt glaciation;  
ironstone

*Major unconformity*  
Marine shelf deltaic cycles

Marine shelf deltaic cycles

Paralic carbonate deposition; magnesite;  
local felsic magmatism ~790 Ma

Renewed rifting; fluvial, shallow marine and  
deltaic sedimentation; minor bimodal volcanism

Rift basins; mixed clastic-carbonate-evaporite  
sedimentation ~800 Ma; minor volcanism

Extensive mafic magmatism ~830 Ma

Intracontinental sag basin; basal supermature  
sand sheet, transgressive carbonate

Marinoan	Pound unnamed
	Sandison
	Yerelina
	Upalinna
	Nepouie
Sturtian	Yudnamutana
	Belair
	Bungarider
Torrensian	Mundallio
	Emeroo
	Curdimurka
Willouran	Arkaroola

Relative sea levels  
rising falling



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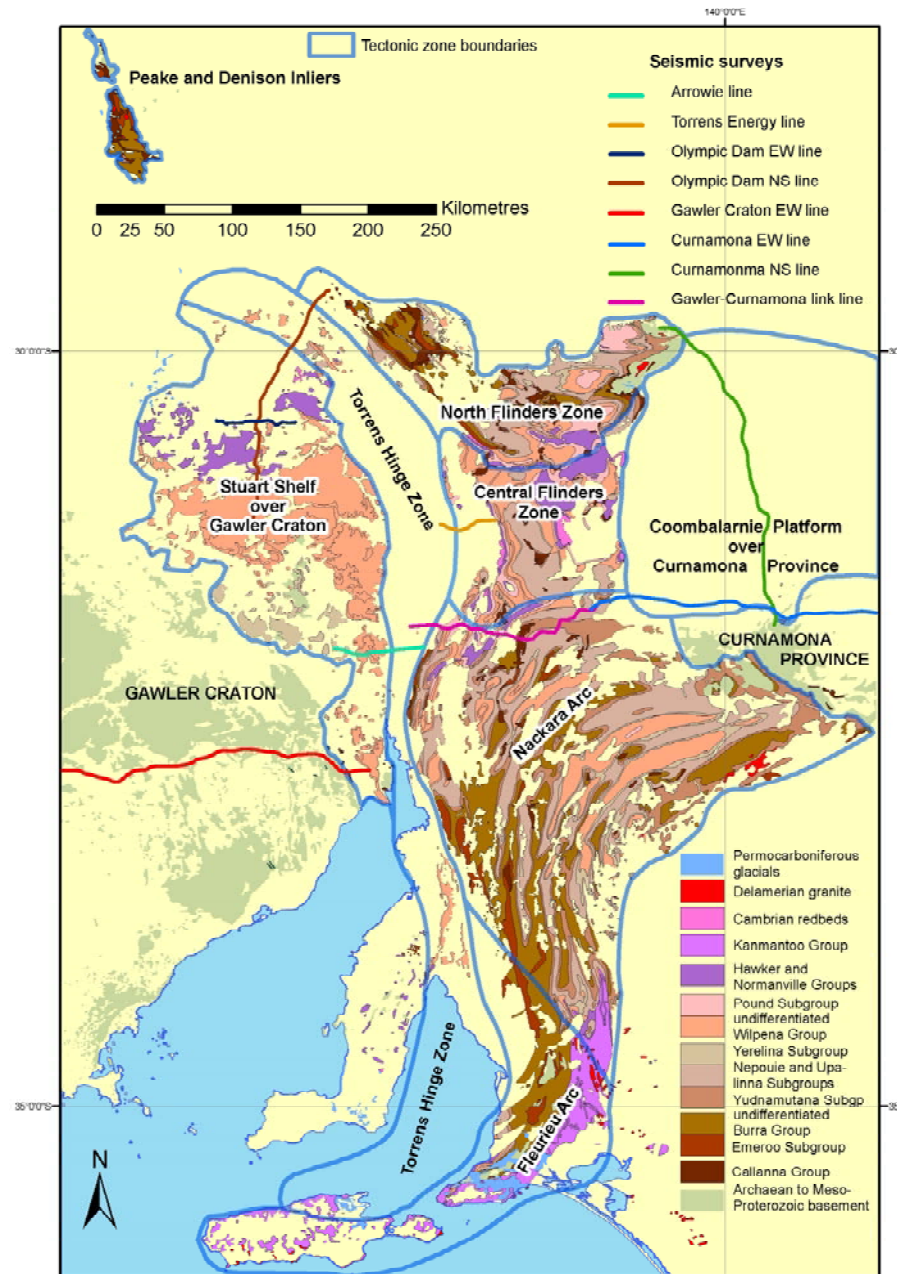


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# TECTONIC ZONES OF DELAMERIAN OROGEN

- **Stuart Shelf and Coombalarnie Platform:**  
*platform cover over shallow cratonic basement*
- **Torrens Hinge Zone:**  
*transitional between platform and orogen;  
basement moderately deep*
- **Central Flinders Zone:**  
*openly folded thick cover moderately to very  
deep basement; domes and basins*
- **North Flinders Zone:**  
*arcuate fold belt over very deep basement  
except Mount Painter Inliers*
- **Nackara Arc:**  
*arcuate fold belt with extremely deep basement  
except Willyama Inliers of Curnamona Province*
- **Fleurieu Arc:**  
*arcuate fold-thrust belt with moderately deep  
basement, except Mount Lofty Ranges Inliers*



# DELAMERIAN DEFORMATION

## •Fleurieu Arc:

*Early NW-directed thrusts and asymmetric folds, and shallow SE-dipping cleavage (?late early Cambrian, 510-515 ma) during deposition of redbeds in Central Flinders Zone*

## •Nackara Arc:

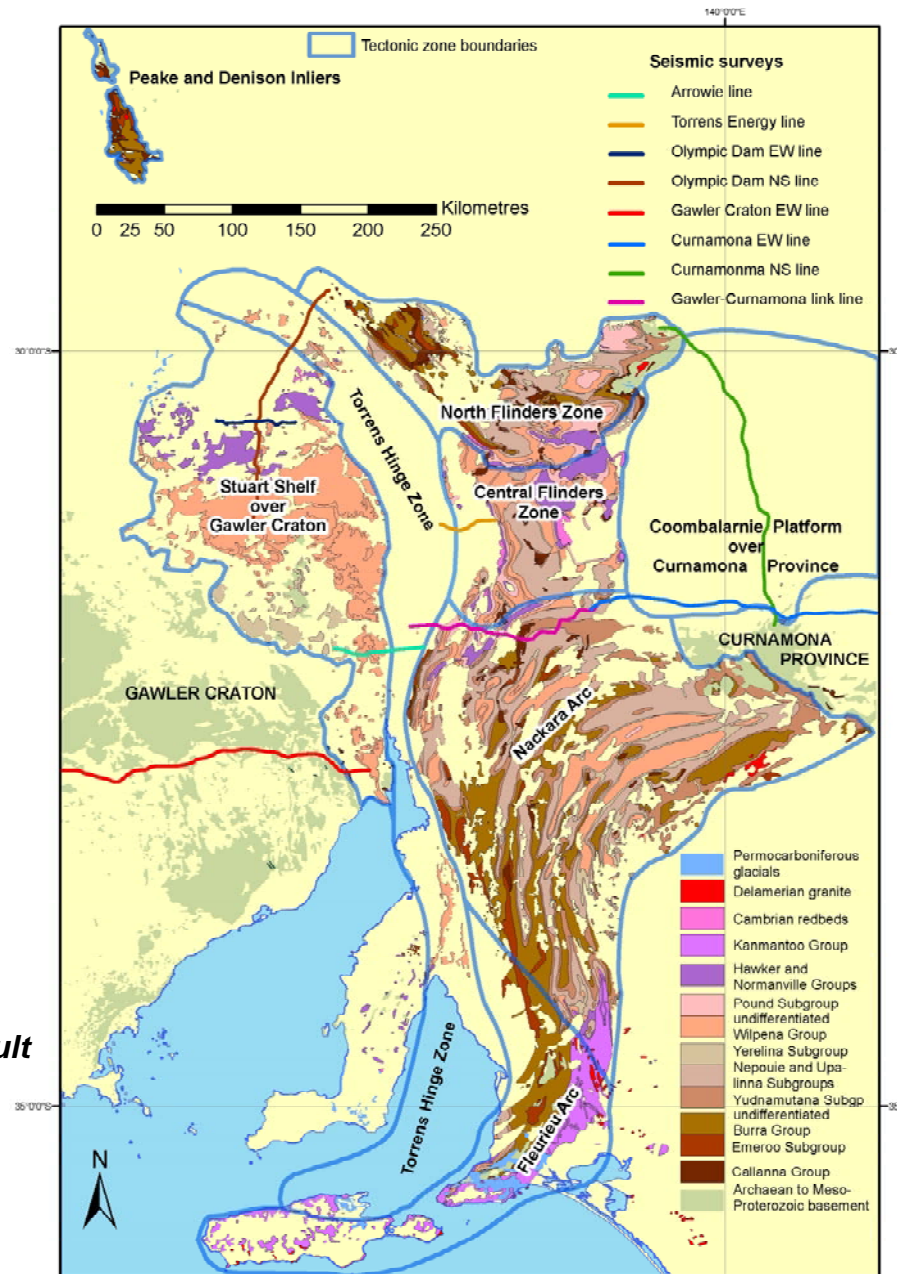
*Early structures overprinted by upright folds in sinistral transpressional regime as deformation propagated northward*

## •Central Flinders Zone:

*Open dome and basin folds developed after deposition of ?mid-Cambrian redbeds*

**Gawler-Curnamona Link Line traverses eastern Torrens Hinge Zone and Nackara Arc near its northern transitional boundary**

- *Tectonic style is transitional*
- *Much of the line runs sub-parallel to strike*
- *Not ideally oriented to image Delamerian fold and fault geometry*
- *Nevertheless, it images most of the sedimentary pile and some deep-seated structures and crustal boundaries*





138°0'0"E

138°30'0"E

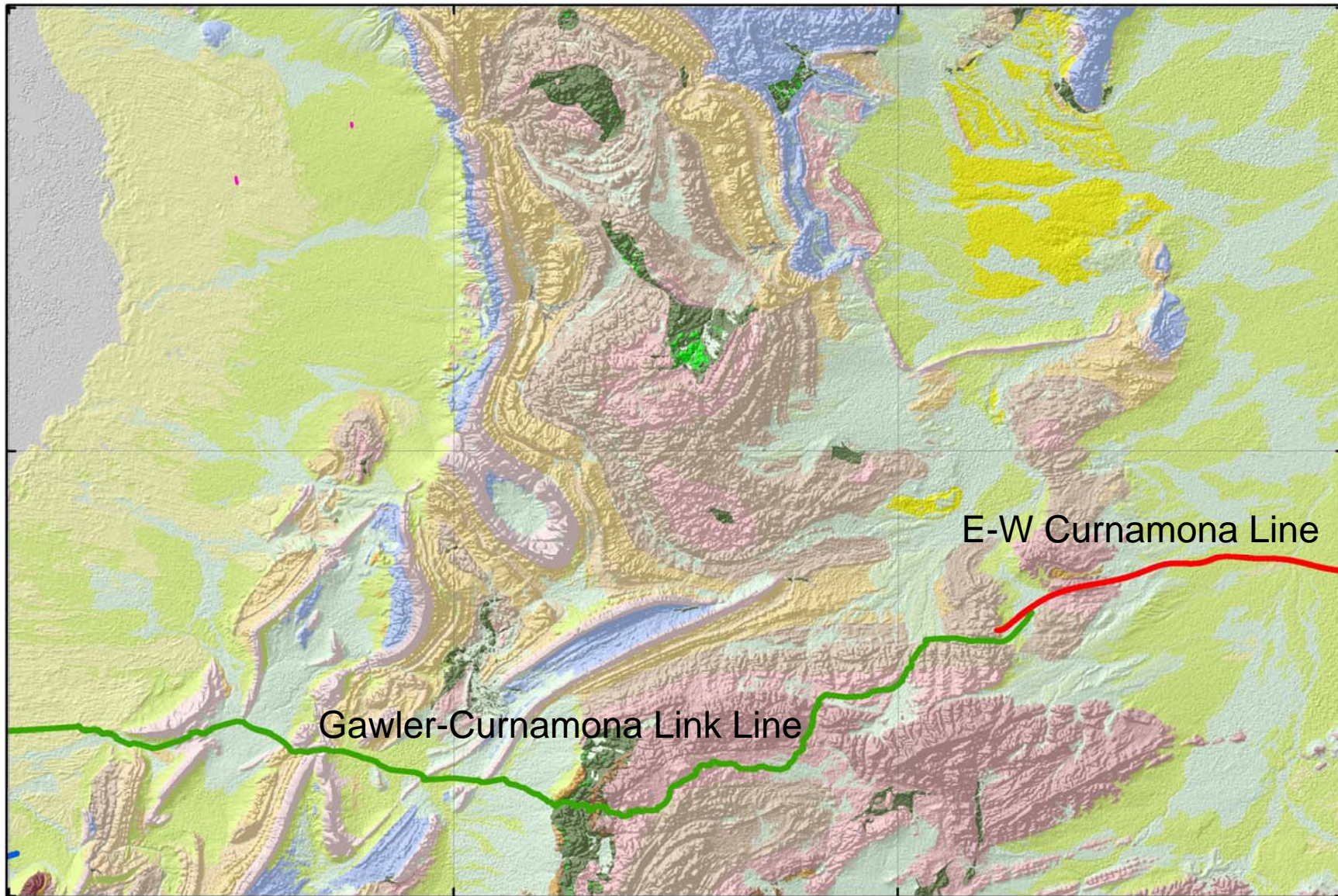
139°0'0"E

139°30'0"E

31°0'0"S

31°30'0"S

32°0'0"S



PARACHILNA 1:250 000 Map area showing seismic lines



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138°0'0"E

138°30'0"E

139°0'0"E

139°30'0"E

31°0'0"S

31°30'0"S

32°0'0"S

Seismic line follows road through gaps  
in quartzite ridges due to faulting



PARACHILNA 1:250 000 Map area showing seismic lines



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138°0'0"E

138°30'0"E

139°0'0"E

139°30'0"E

31°0'0"S

31°30'0"S

32°0'0"S

Steeply dipping and disrupted sediments  
and diapiric breccia

PARACHILNA 1:250 000 Map area showing seismic lines



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138°0'0"E

138°30'0"E

139°0'0"E

139°30'0"E

31°0'0"S

Seismic line runs sub-parallel to strike

31°30'0"S

32°0'0"S

PARACHILNA 1:250 000 Map area showing seismic lines



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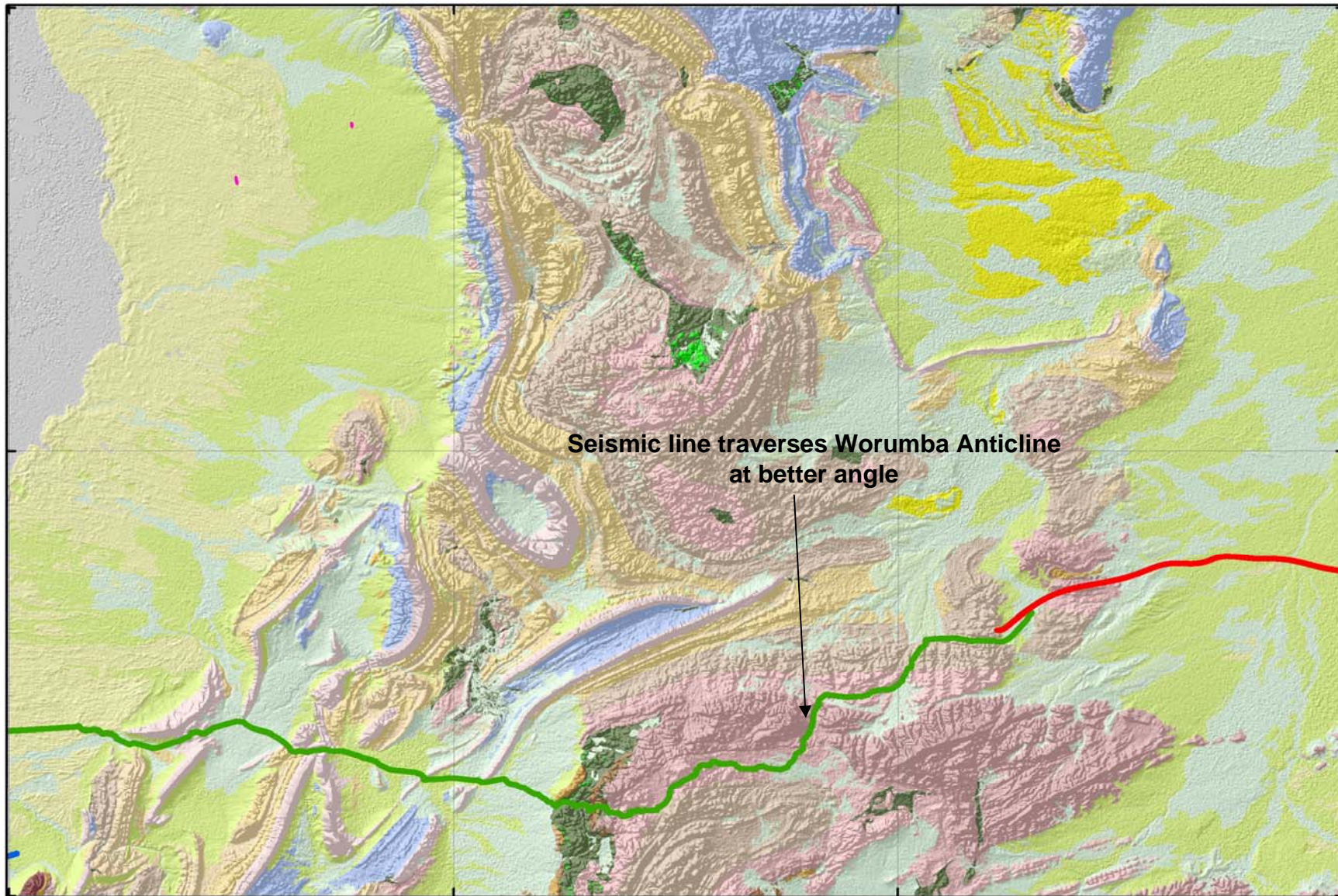
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138°30'0"E

139°0'0"E

139°30'0"E

31°0'0"S



31°30'0"S

32°0'0"S

Seismic line traverses Worumba Anticline  
at better angle

PARACHILNA 1:250 000 Map area showing seismic lines



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138°0'0"E

138°30'0"E

139°0'0"E

139°30'0"E

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31°30'0"S

32°0'0"S

Anticline in Wonoka Formation  
overlain by Pound Subgroup

Synclines containing  
Cambrian Hawker Group  
limestones

Steeply W-dipping  
Burra Group dolomite,  
siltstone

Diapiric breccia

Burra Group core of  
Willipa Anticline

Upalinna Subgroup

Nepouie Subgroup

Bibliando Dome:  
>3 km Yudnamutana  
Subgroup

PARACHILNA 1:250 000 Map area showing seismic lines



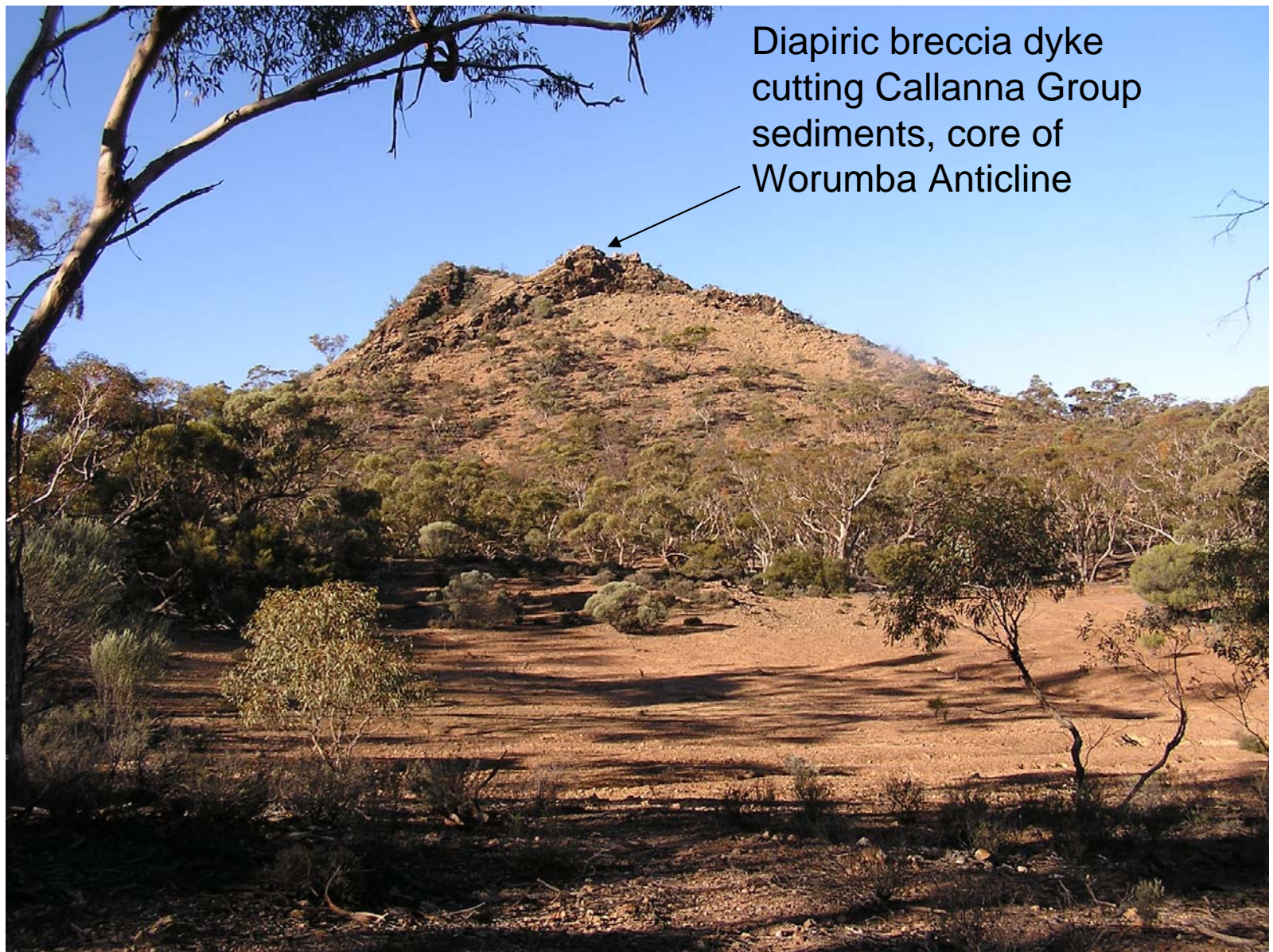
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Diapiric breccia dyke  
cutting Callanna Group  
sediments, core of  
Worumba Anticline







Gently dipping quartzite member of Wilyerpa Formation near axis of  
Worumba Anticline



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North dipping calcareous siltstone, lower Upalinna Subgroup



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Cross-bedded sandy limestone, Wonoka Formation



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Gently east-dipping Bonney Sandstone, Pound Subgroup



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Gently dipping Rawnsley Quartzite, Pound Subgroup



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## Unconformity between basalt and Emeroo Subgroup

