

# The SA Discovery Mapping project – how GSSA are tackling spatial and textural geoscience data

Mark Pawley on behalf of the SADM team

NTGS Gabfest | 20<sup>th</sup> February 2025

[energymining.sa.gov.au](http://energymining.sa.gov.au)



# What is the problem?

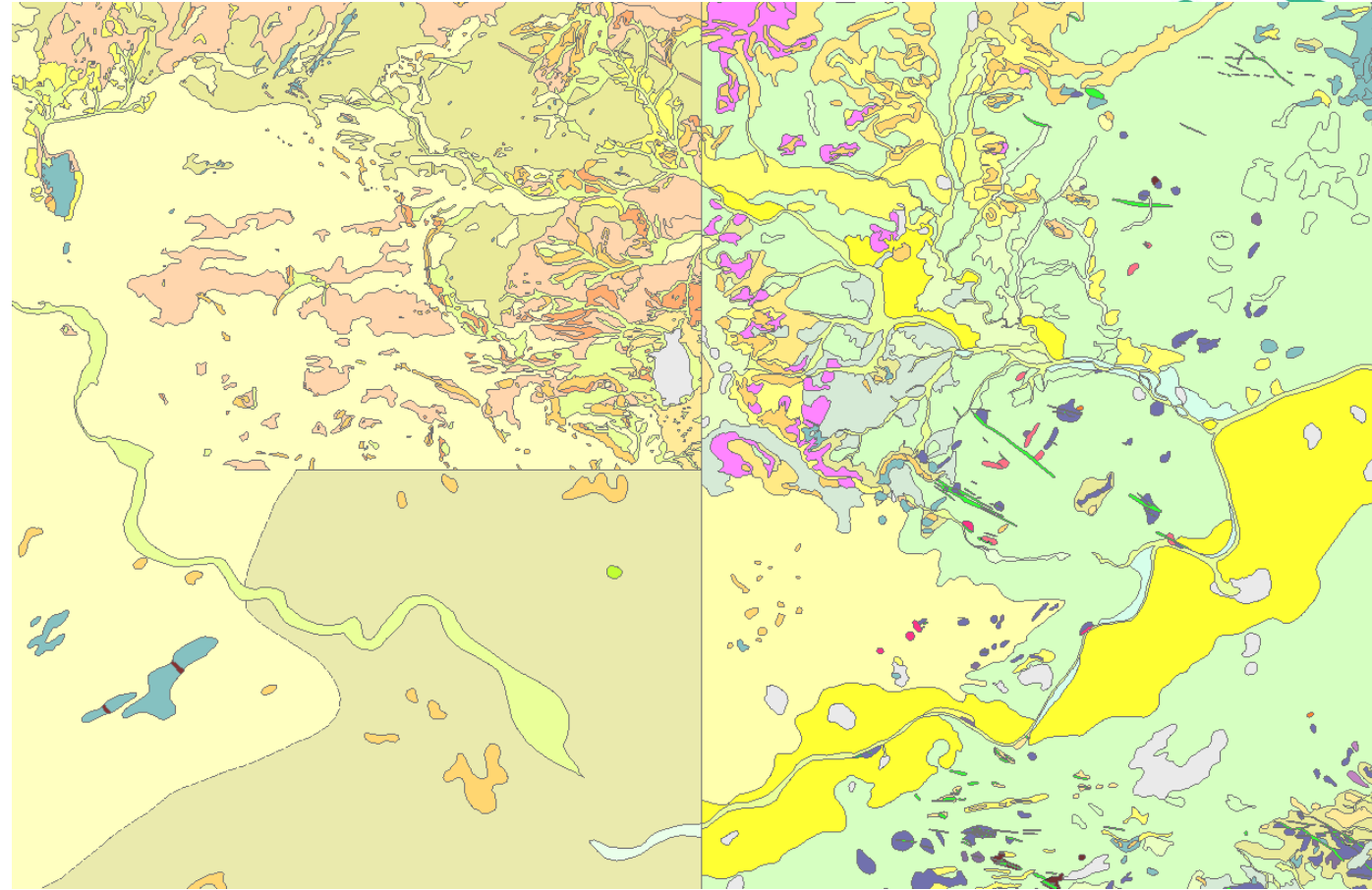
Our current geological data is often the aggregation of digitised paper maps.

Poor attribution of spatial features.

GSSA data is currently stored in several databases across several departments.

Slow release of new data.

Consequently, our digital data often does not take recent findings into account.



The Gawler Challenge competitors found our data to be non-seamless with coarse resolution. A large part of their time was massaging the data into a useable form.

# Opportunities provided by SADM

We can take control of our database.

Control how the data is compiled, stored, and released.

Ability to update our spatial and textural geological data.

Generation of data-rich geological information.

Allows the timely release of new and updated data.



**SADM is modernising the capture, management, delivery, and scope of South Australia's precompetitive geological data.**

# Components of the SADM project

Map compilation team, who will compile the spatial data.

Issues and decisions register.

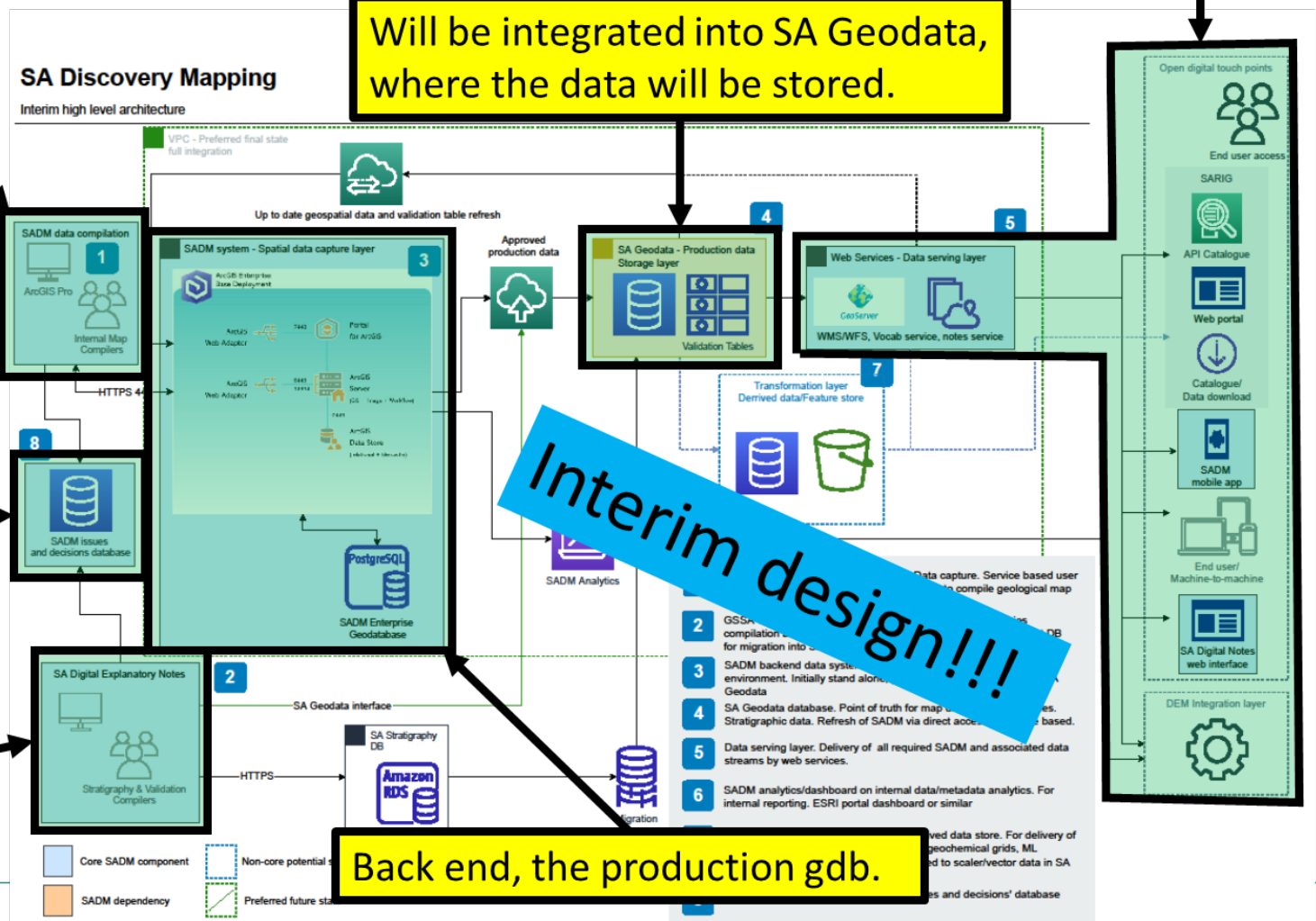
SA DEN team, who will compile the text-based data.

Front end, which will deal with data delivery.

Will be integrated into SA Geodata, where the data will be stored.

Back end, the production gdb.

Interim design!!!



# Back-end system

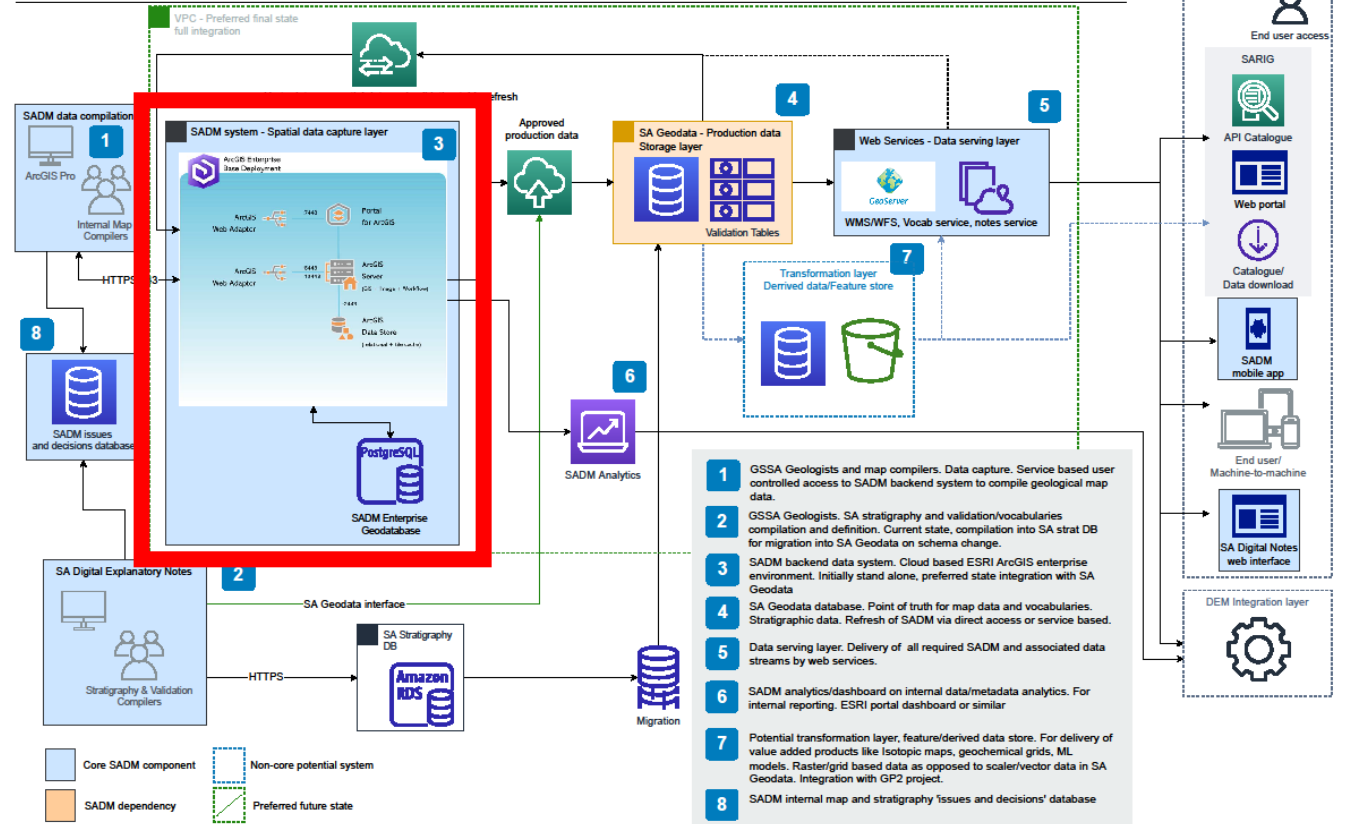
We're working with an Enterprise database.

This system is:

- Relational database.
- Service-based architecture (connected through web services).
- Cloud-based deployment.
- Uses ArcGIS PRO for compilation.

## SA Discovery Mapping

Interim high level architecture



# Digital explanatory notes (DEN)

Stratigraphic unit descriptions are currently being reviewed, updated or rewritten.

Descriptions for the Provinces, Events, and Time Slices are being updated or prepared.

The DEN will comprise live 'documents'.

These 'documents' will be linked to the spatial features.

[Download report](#)

GSSA Digital Explanatory Notes  
Stratigraphic Unit Report



## Christie Gneiss (ALmc)

Megan Williams, Anthony Reid, Mark Pawley

### Description

Predominantly metasedimentary gneiss with migmatitic layers. Paragneiss, iron formation, carbonate, calciliccate and quartzite with minor volcanoclastic and mafic lithologies. Max deposition age c. 2485–2480 Ma; metamorphosed c. 2470–2415 Ma. Hosts Challenger gold deposit.

Distribution map

[Download report](#)

GSSA Digital Explanatory Notes  
Tectonic Event Report



## Petermann Orogeny (PET)

Tania Wilson, Mario Werner, Megan Williams

### Description

c. 630–520 Ma. Musgrave Province. Intracontinental deformation. Early phase of E-W compressional deformation at c. 630 Ma. Main phase of the Orogeny involved N-directed shortening producing E-trending crustal-scale faults and shear zones. Resulted in dismemberment of the Centralian Superbasin and reworking of Proterozoic basement.

### Provinces

[Musgrave Province](#), [Officer Basin](#), [Bitchera Ridge](#)

northeast of Tarcoola, within and area >25 000 km<sup>2</sup> consists of compositionally layered

[Download report](#)

GSSA Digital Explanatory Notes  
Province Report



## Gawler Craton

Megan Williams, Stacey Curtis, Anthony Reid

### Description

The Gawler Craton is an extensive region of Archaean to Mesoproterozoic crystalline basement underlying approximately 440,000 km<sup>2</sup> of central South Australia.

**Synonyms:** Described but not defined

**Time Slice(s):** [Archean-Paleoproterozoic](#), [Early Paleoproterozoic](#), [Late Paleoproterozoic](#), [Toondulva](#), [Paleo-Mesoproterozoic](#), [Mesoproterozoic](#)

[Drillholes](#)
[Samples](#)

### Extent

Something about geophysical/outcrop extent.

### Summary Geology

The Christie Gneiss occurs in the northern and western Mulgathing Complex, northeast of Tarcoola, within and area >25 000 km<sup>2</sup>. Outcrop and drillhole intersection in the area are sparse. The formation consists of compositionally layered metasediments with interlayered felsic and mafic igneous lithologies. Quartzofeldspathic migmatitic gneisses with mostly

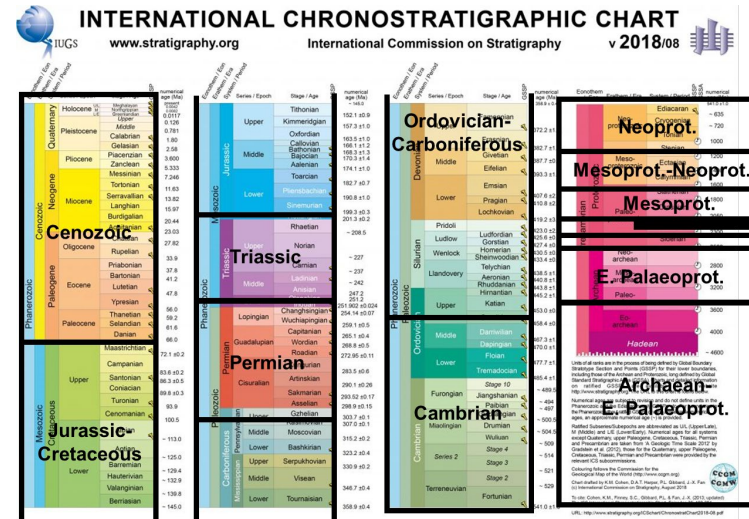


formation that resulted in dismemberment of the Centralian Superbasin in the northern regions of South Australia and across central

# Compilation of spatial data

New system that includes:

- 15 time slices.
- Greater attribution.
- Standard vocabulary.
- One to many relationship.

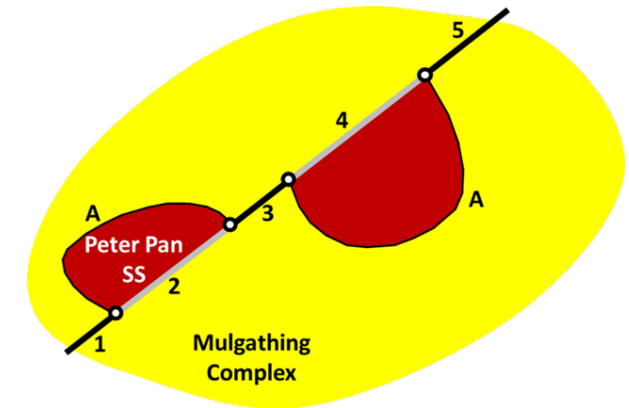
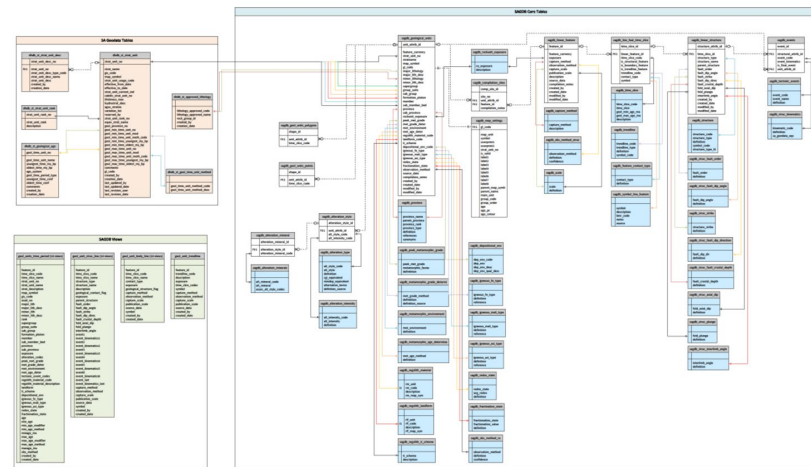


SA Geodata Database: Orthothole Details

Orthothole Name	19C_110
Orthothole Location	19C_110
Orthothole Name	19C_110
Orthothole Description	Orthothole
Orthothole Code	19C_110

granite  
Phanerozoic crystalline rock consisting of quartz, alkali feldspar and plagioclase (typically sodic) in variable amounts, usually with biotite and/or hornblende. Includes rocks defined modestly in QAPP Field 3.

example: charnockite  
broader: gneiss  
narrower: monzogranite, syenogranite  
source: LeMaitre et al. 2002  
type: Resource  
in scheme: Concept  
is primary topic of: granite



# Time slices

15 time slices (currently 5).

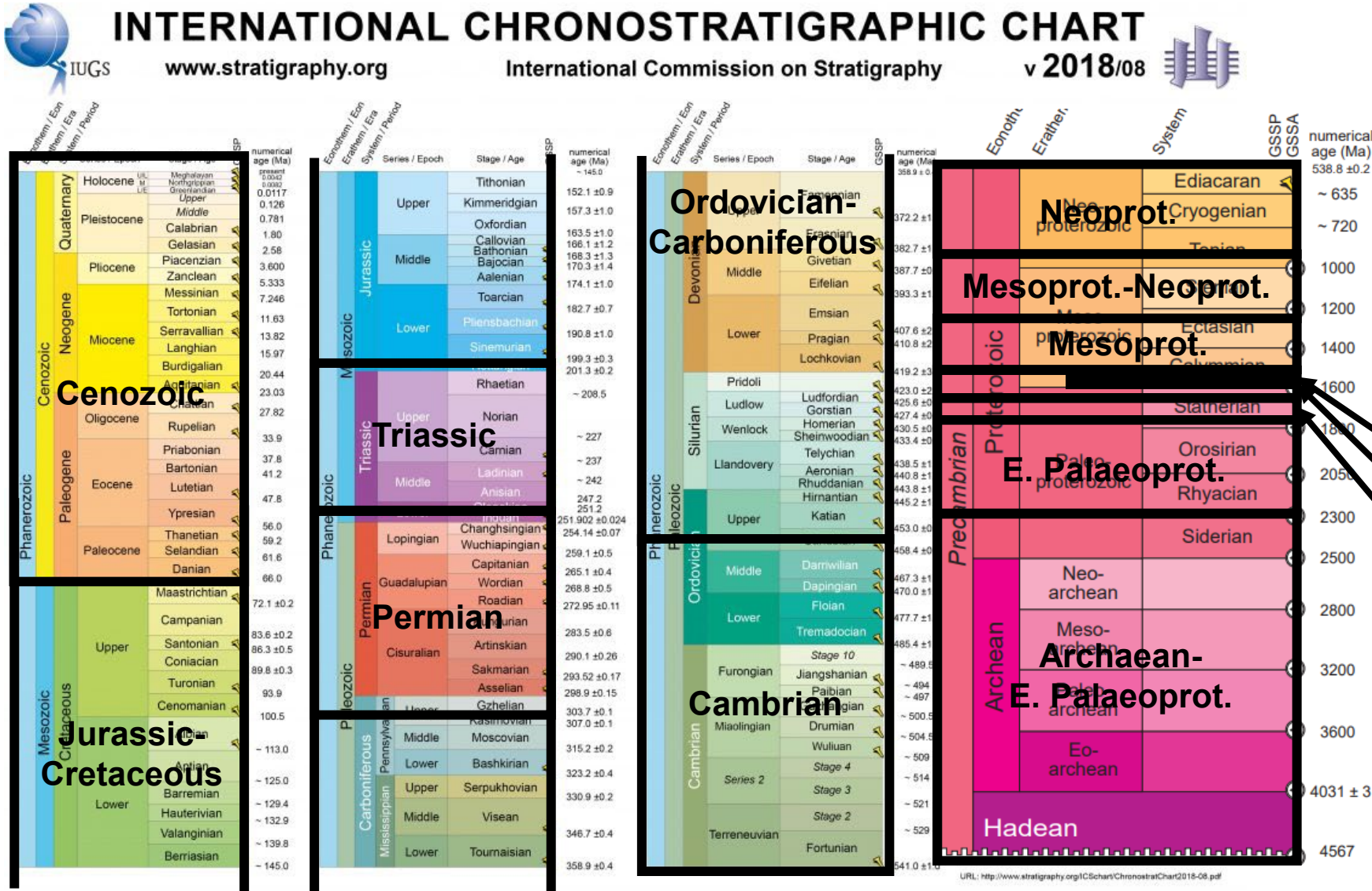
Chronological approach.

Not depth slices!

Based on periods of broadly similar geological activity in SA.

Certain events are differentiated.

Greater flexibility when examining the data and generating bespoke digital 'maps'.



Toondoolya (Hiltaba/GRV)

Palaeoprot.-Mesoprot.

L. Palaeoprot.



# Vocabulary

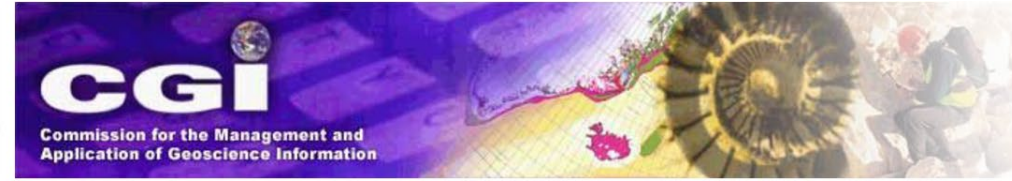
SADM will use vocabularies- lists of standard terminology and concept relationships.

GeoSciML provides an international standard.

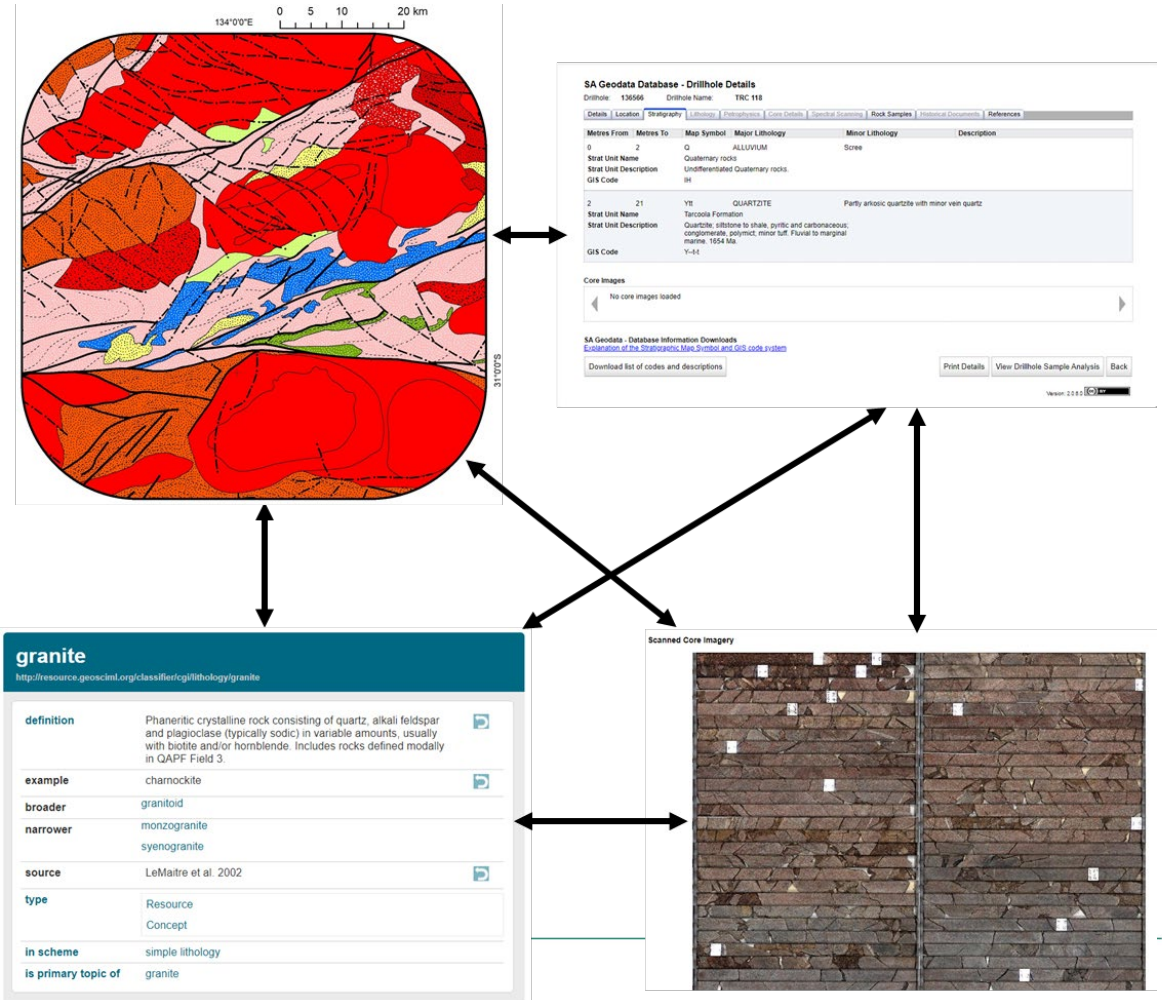
Allows SADM to harmonise with other GSSA databases, e.g. downhole logs, MINDEP.

Increased interoperability will enable the next generation of machine learning, AI, and mineral exploration.

OFFICIAL



[CGI Home](#) | [GeoSciML Home](#) | [GeoSciML Wiki](#) | [EarthResourceML](#) | [Vocabularies](#)



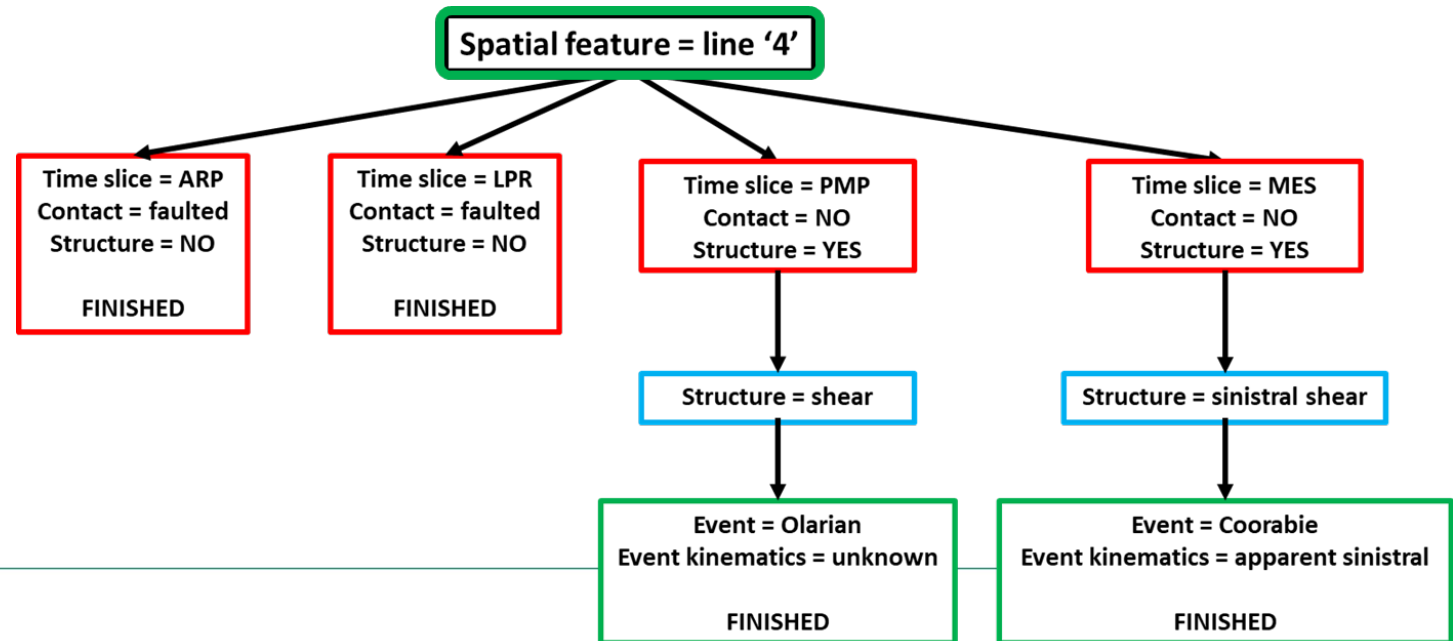
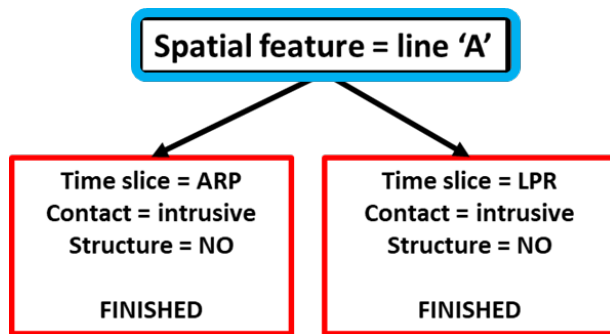
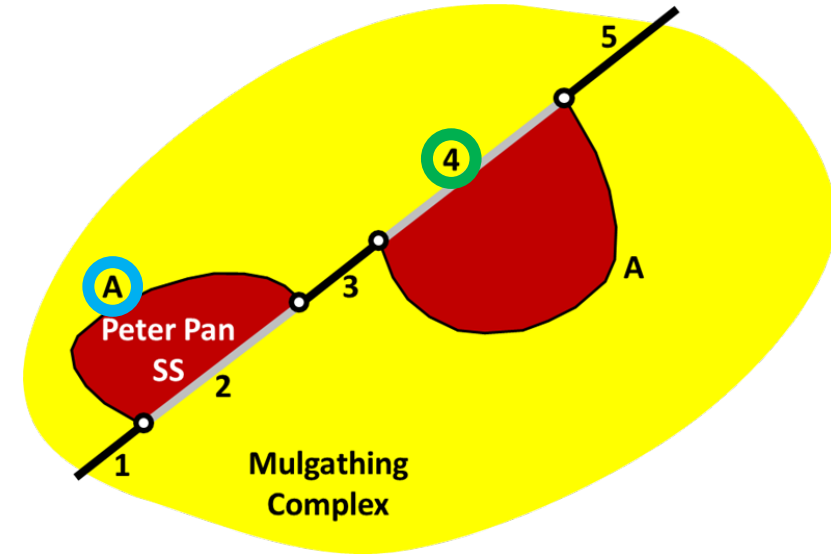
# One to many relationship

System where a single linear feature is drawn, with the option of relating >1 sets of attribution.

This allows for the easy attribution of reactivated structures and boundaries across one or more time slices.

In contrast, a one-to-one relationship would require a separate linear feature for each line of attribution. This means that separate lines would need to be drawn for each relevant time slice.

Example with a c. 1730 Ma pluton in c. 2480 Ma rocks cut by a 1580 Ma shear that is reactivated at c. 1450 Ma.



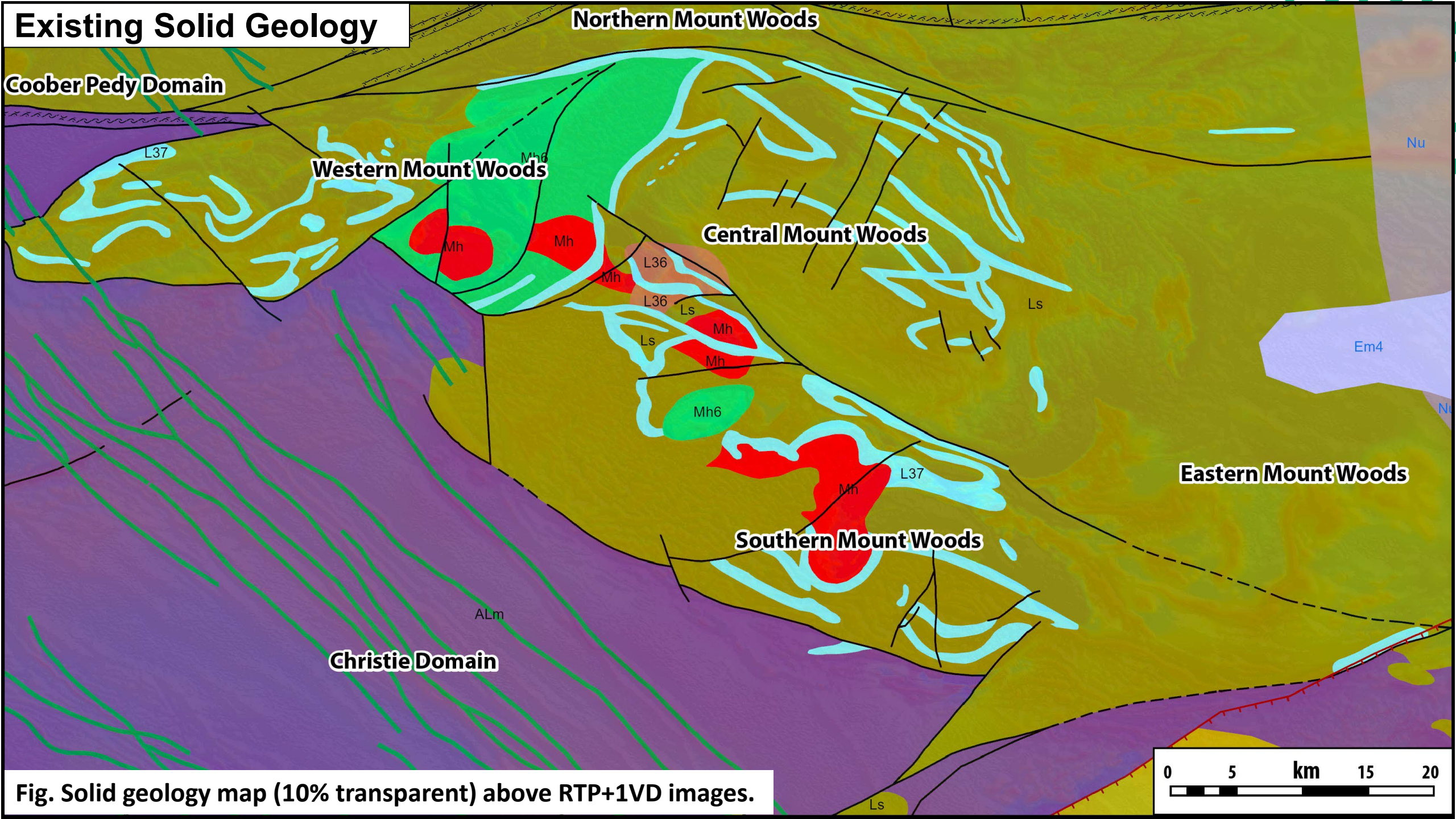


Fig. Solid geology map (10% transparent) above RTP+1VD images.

# SADM compilation work

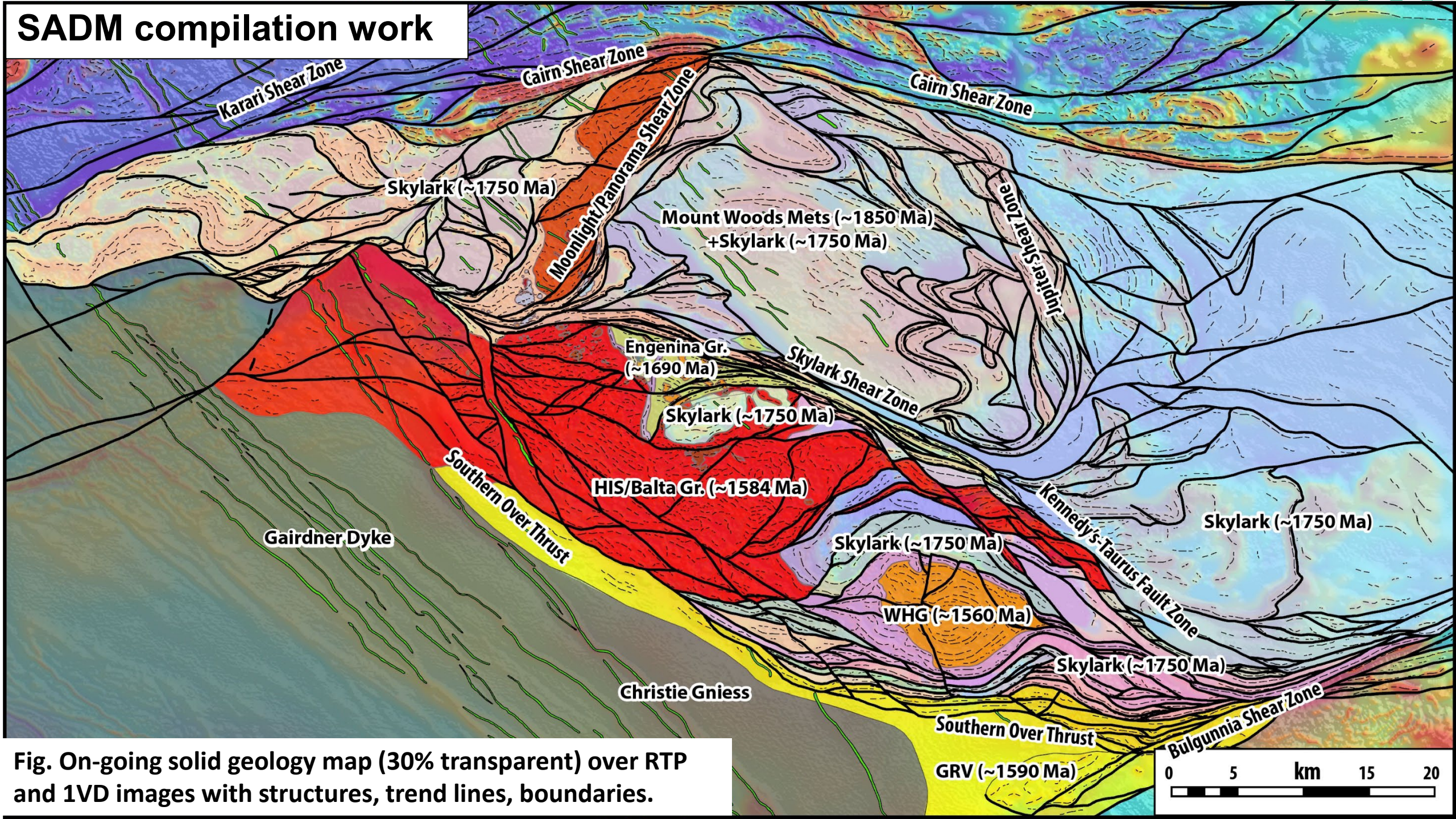
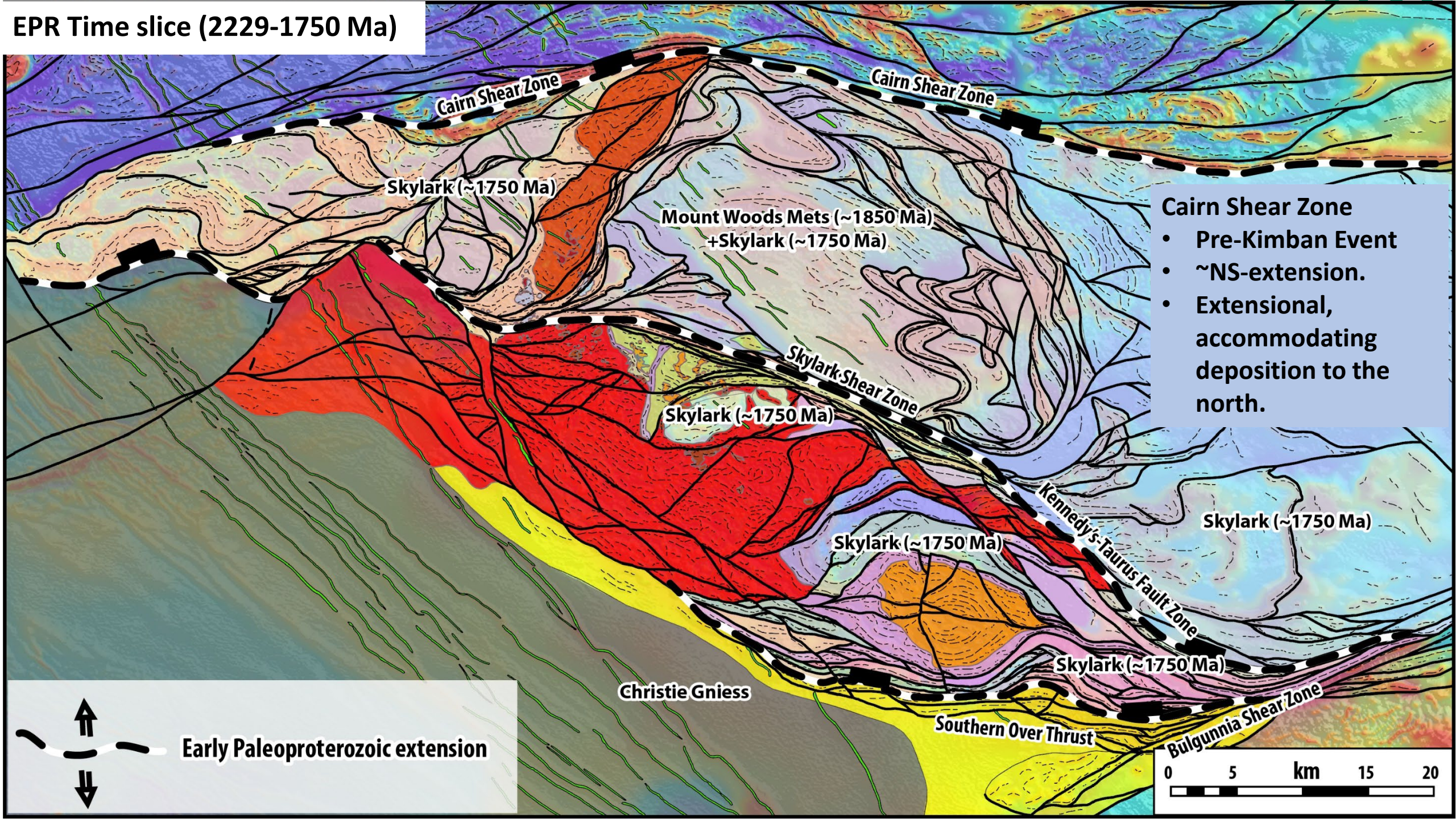


Fig. On-going solid geology map (30% transparent) over RTP and 1VD images with structures, trend lines, boundaries.

# EPR Time slice (2229-1750 Ma)



Cairn Shear Zone

Cairn Shear Zone

Skylark (~1750 Ma)

Mount Woods Mets (~1850 Ma)  
+ Skylark (~1750 Ma)

- Cairn Shear Zone**
- Pre-Kimban Event
  - ~NS-extension.
  - Extensional, accommodating deposition to the north.

Skylark Shear Zone

Skylark (~1750 Ma)

Kennedy's Taurus Fault Zone

Skylark (~1750 Ma)

Skylark (~1750 Ma)

Skylark (~1750 Ma)

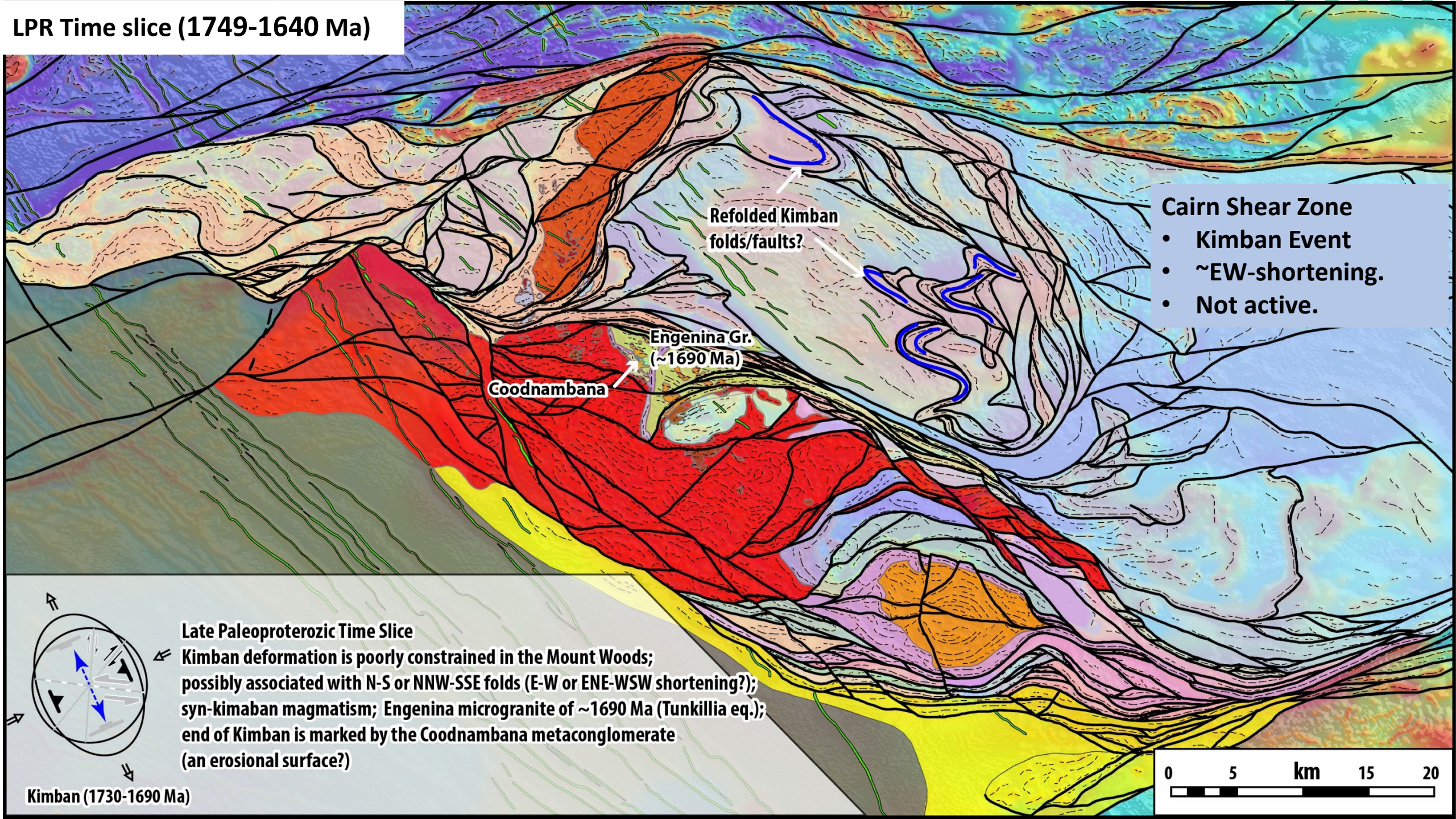
Christie Gniess

Southern Over Thrust

Bulgunnia Shear Zone



# LPR Time slice (1749-1640 Ma)



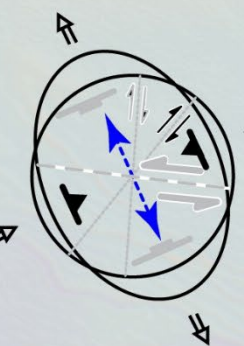
**Cairn Shear Zone**

- Kimban Event
- ~EW-shortening.
- Not active.

Refolded Kimban folds/faults?

Engenina Gr. (~1690 Ma)

Coodnambana

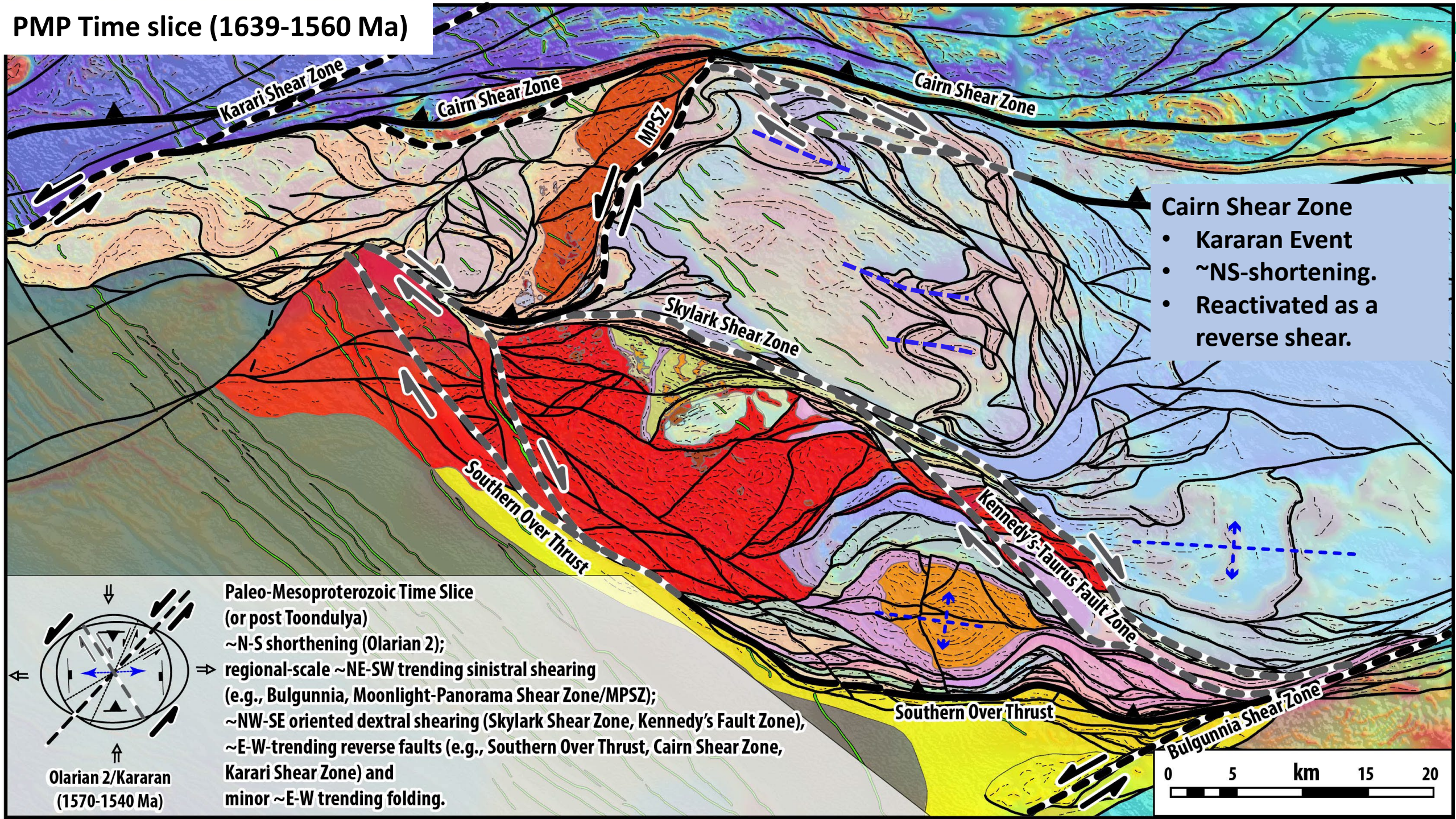


**Late Paleoproterozoic Time Slice**  
Kimban deformation is poorly constrained in the Mount Woods; possibly associated with N-S or NNW-SSE folds (E-W or ENE-WSW shortening?); syn-kimaban magmatism; Engenina microgranite of ~1690 Ma (Tunkillia eq.); end of Kimban is marked by the Coodnambana metaconglomerate (an erosional surface?)

Kimban (1730-1690 Ma)



# PMP Time slice (1639-1560 Ma)

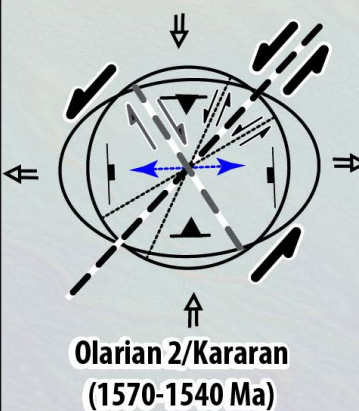


**Cairn Shear Zone**

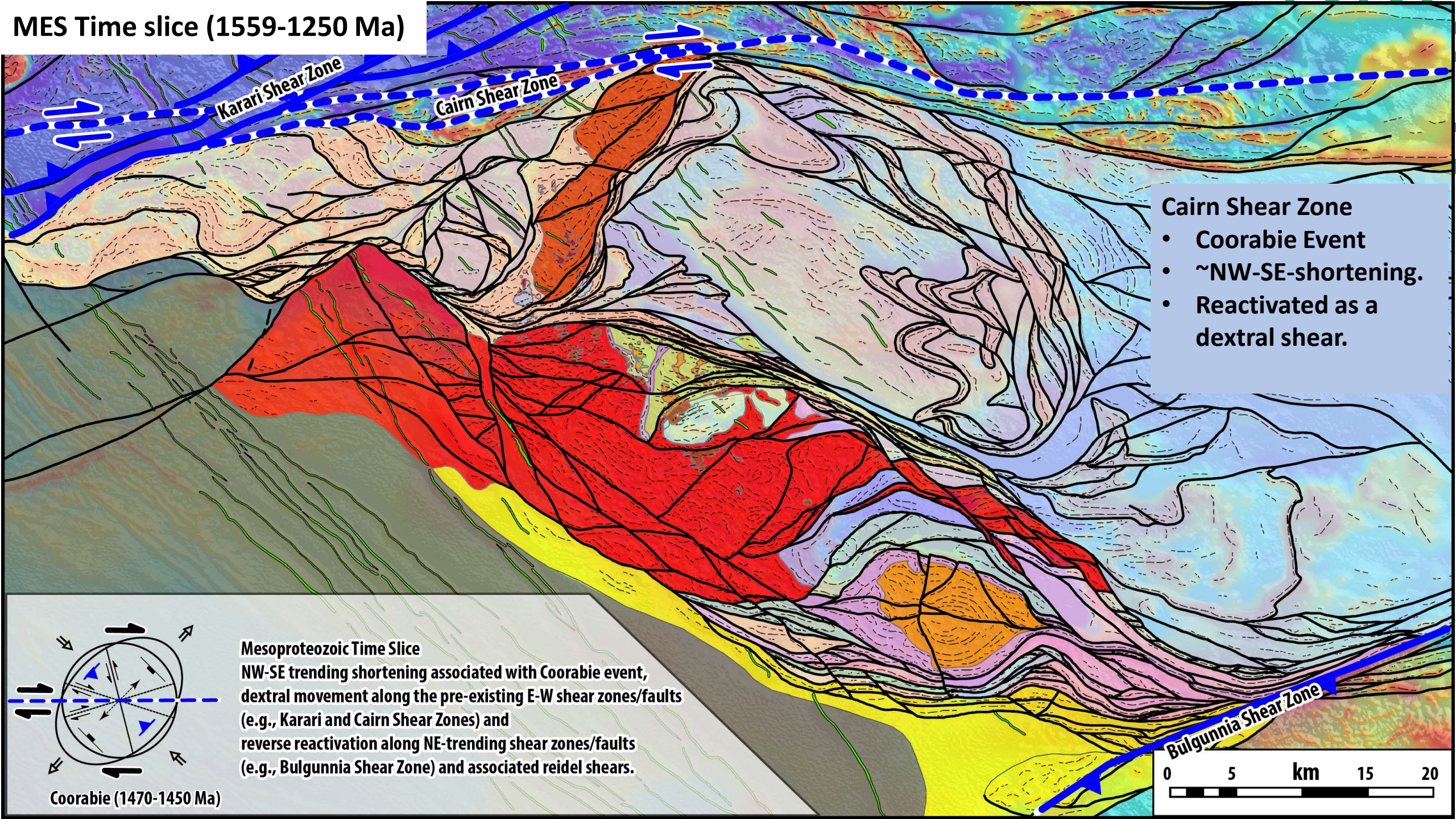
- Kararan Event
- ~NS-shortening.
- Reactivated as a reverse shear.

**Paleo-Mesoproterozoic Time Slice (or post Toondulya)**

- ~N-S shortening (Olarian 2);
- regional-scale ~NE-SW trending sinistral shearing (e.g., Bulgunnia, Moonlight-Panorama Shear Zone/MPSZ);
- ~NW-SE oriented dextral shearing (Skylark Shear Zone, Kennedy's Fault Zone),
- ~E-W-trending reverse faults (e.g., Southern Over Thrust, Cairn Shear Zone, Karari Shear Zone) and
- minor ~E-W trending folding.



# MES Time slice (1559-1250 Ma)



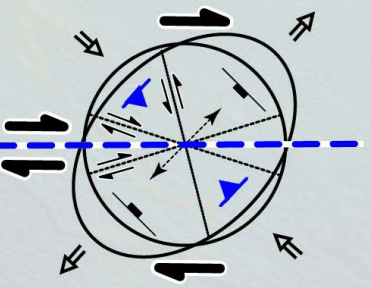
Karari Shear Zone

Cairn Shear Zone

**Cairn Shear Zone**

- Coorabie Event
- ~NW-SE-shortening.
- Reactivated as a dextral shear.

Bulgunnia Shear Zone



**Mesoproterozoic Time Slice**  
NW-SE trending shortening associated with Coorabie event, dextral movement along the pre-existing E-W shear zones/faults (e.g., Karari and Cairn Shear Zones) and reverse reactivation along NE-trending shear zones/faults (e.g., Bulgunnia Shear Zone) and associated reidel shears.

Coorabie (1470-1450 Ma)



# Delivery

Currently working on the delivery system.

First release will be delivered mid 2025.

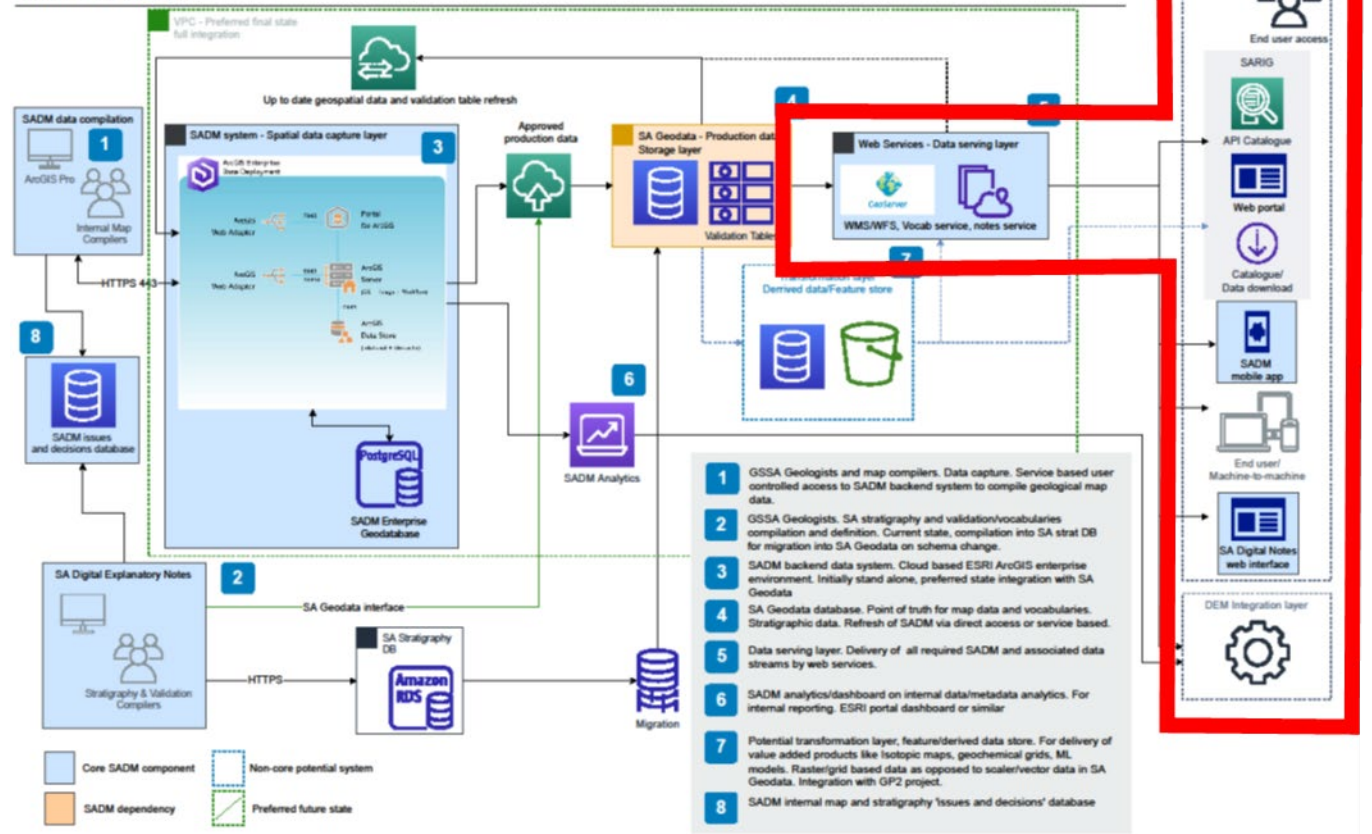
Delivery will be via SARIG and APIs.

Will include:

- Spatial data with extensive attribution.
- Data suitable for machine learning.
- Online access to Digital Explanatory Notes.

## SA Discovery Mapping

Interim high level architecture





# Benefits of SA Discovery Mapping (SADM)

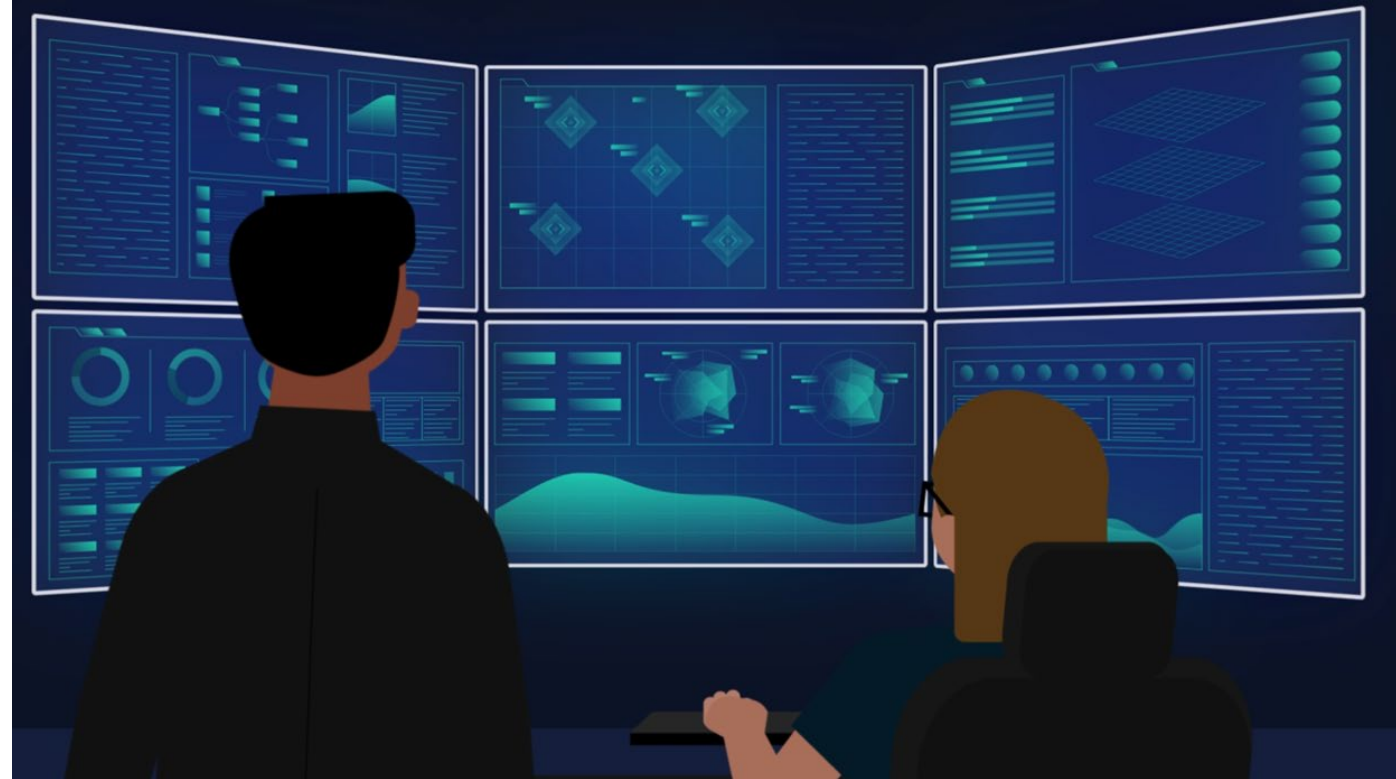
Extensive attribution of lines and polygons will allow interrogation of the data.

The breakdown of the geology into more time slices will allow greater flexibility when:

- generating digital 'maps' and datasets specific to the users' requirements, and
- analysing the data.

Spatial data will be related to the DEN, and other GSSA databases.

Near real time release of updates. Allowing quick incorporation of new results.



# Benefits of SA Discovery Mapping (SADM)

Data will be in a range of formats, suitable for machine learning.

Data will be released via web services or mobile applications.

SADM is designed to be robust and flexible, future proofing the system.



# Contacts

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# Acknowledgement of Country

As guests here on Kurna land, we acknowledge everything this department does impacts on Aboriginal country, the sea, the sky, its people and their spiritual and cultural connection which have existed since the first sunrise. Our responsibility is to share our collective knowledge, recognise a difficult history, respect the relationships made over time, and create a stronger future. We are ready to walk, learn and work together.

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*Ngaityalngadlu taikunthitya yalaka*

*Yantupinarna Kurna yartangka, ngadlu tampinhi tupa yaintya pirku wapinhi, wiwunthi yaitya yarta, yarlu, ngayirda, miyurnakuma paraku tuwila tapa purruna tarraitpayinhi. Muna tirntu parrka-parrka wanti.*

*Ngadluku taingi ngutu yungkurinhi, tampinhi yurni ngantanhi pukingka, niipurna pintyathi mankurrititya, taingintya tarrkarri pintyanhi.*

*Nata ngadlu padnitha, tirkatha Kuma kumangka warpulayi-utha.*

