Department of Natural Resources, Mines and Energy

Interpretation of seismic, gravity and MT in the southern Mount Isa Province

Janelle Simpson

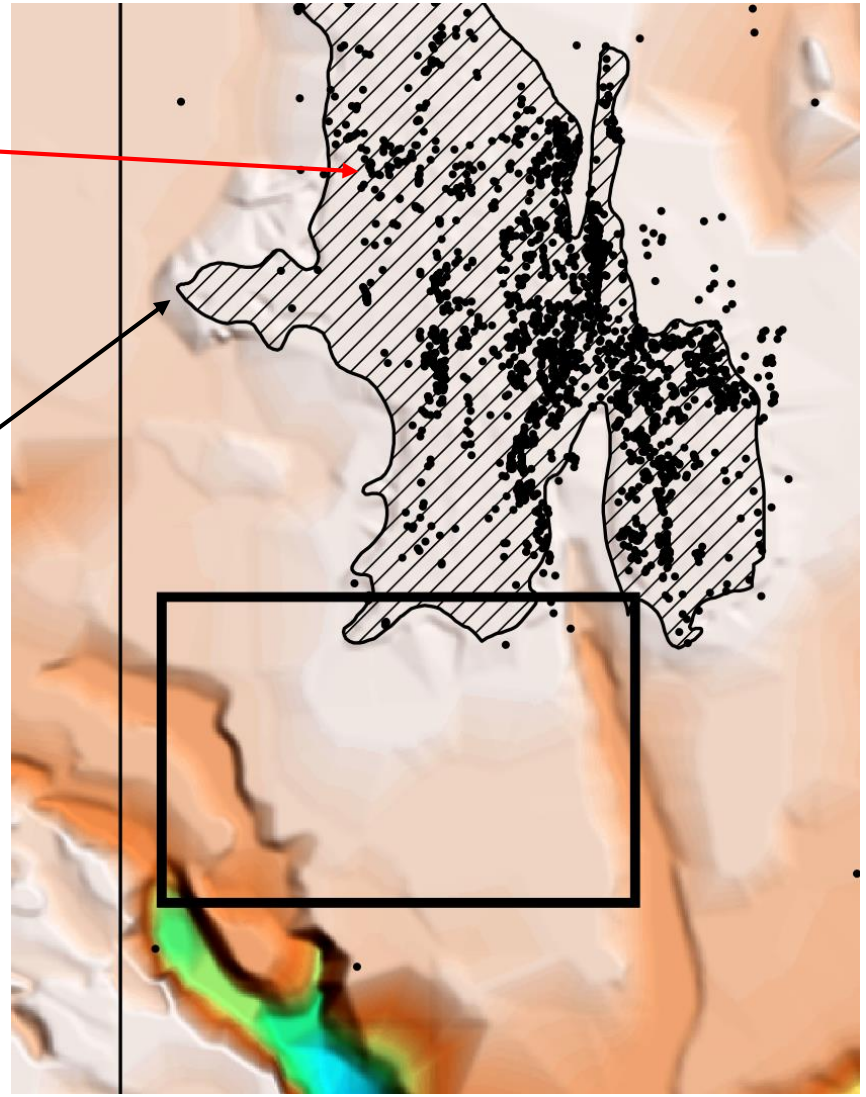
Queensland Government

Overview

- Background
- Seismic and gravity
- Seismic and MT

Project area

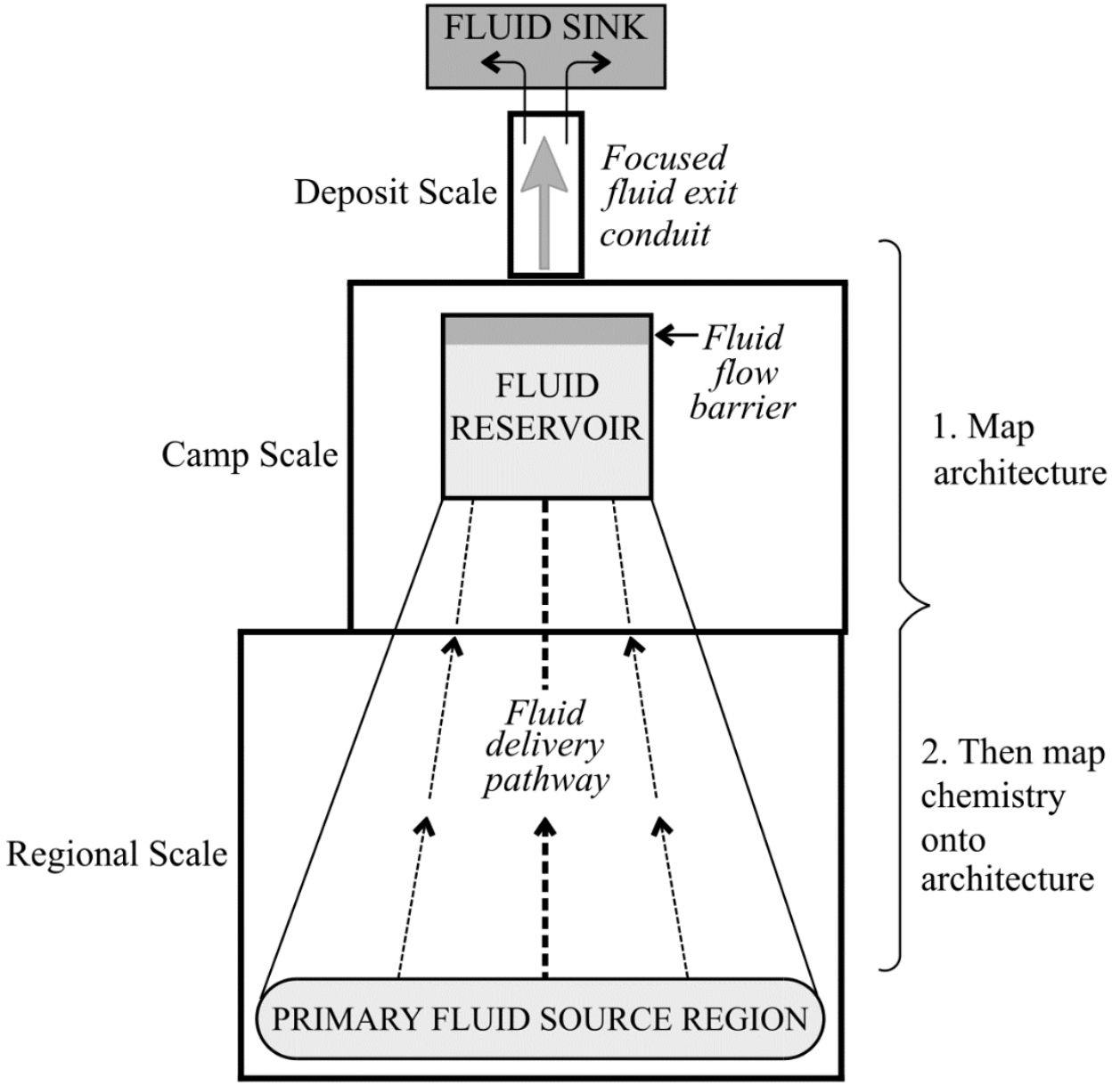
- Poor history of exploration success
- Basement within explorable depths
- Greenfields exploration area



basement depth model from de Vries et al., 2006

Uncover ethos

1. Characterising cover
2. Lithospheric architecture
3. 4D geodynamic and metallogenic evolution
4. Distal footprints



McCuaig and Hronsky, 2014

Uncover ethos

1. Characterising cover
2. **Lithospheric architecture**
3. 4D geodynamic and metallogenic evolution
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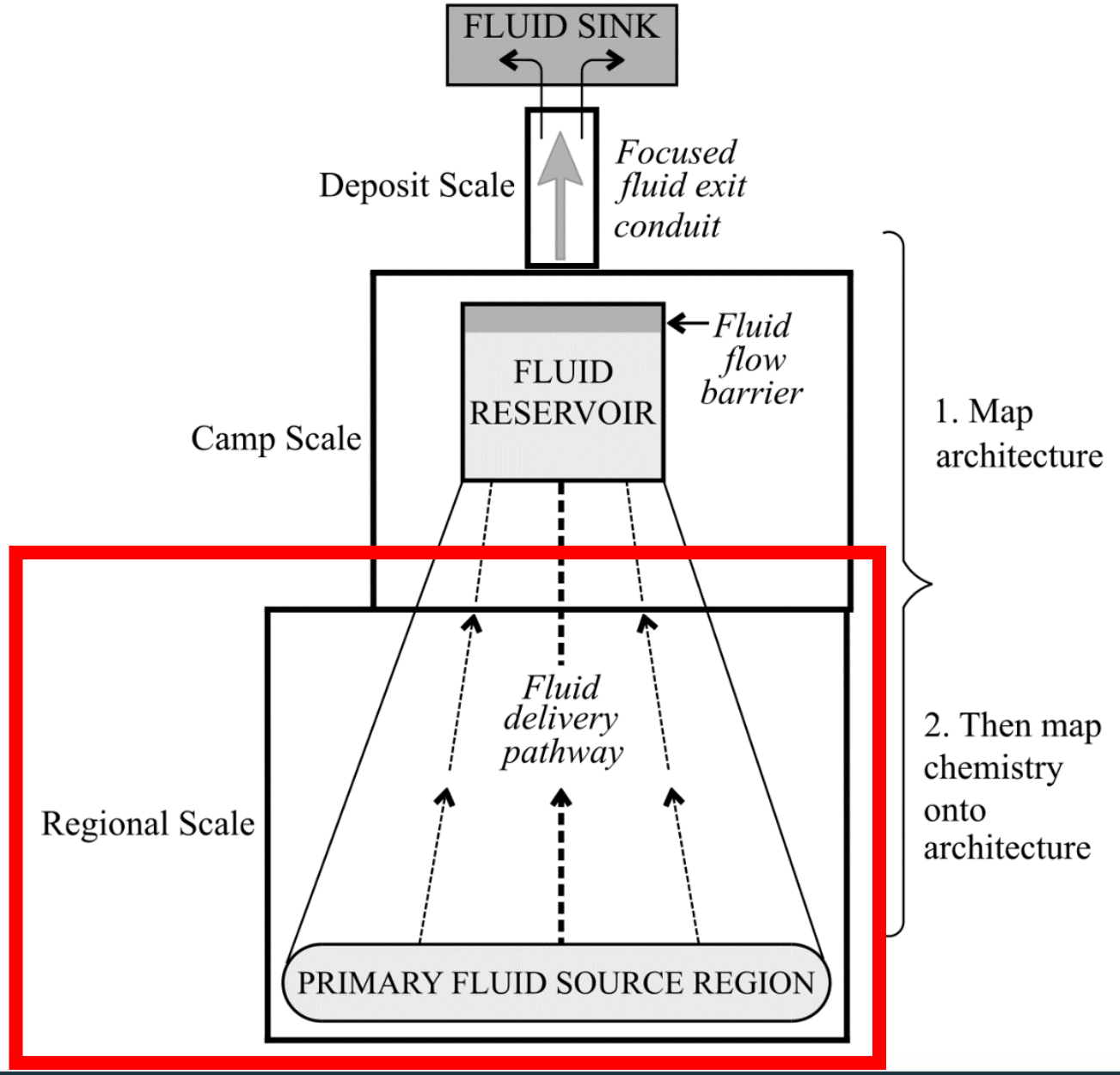
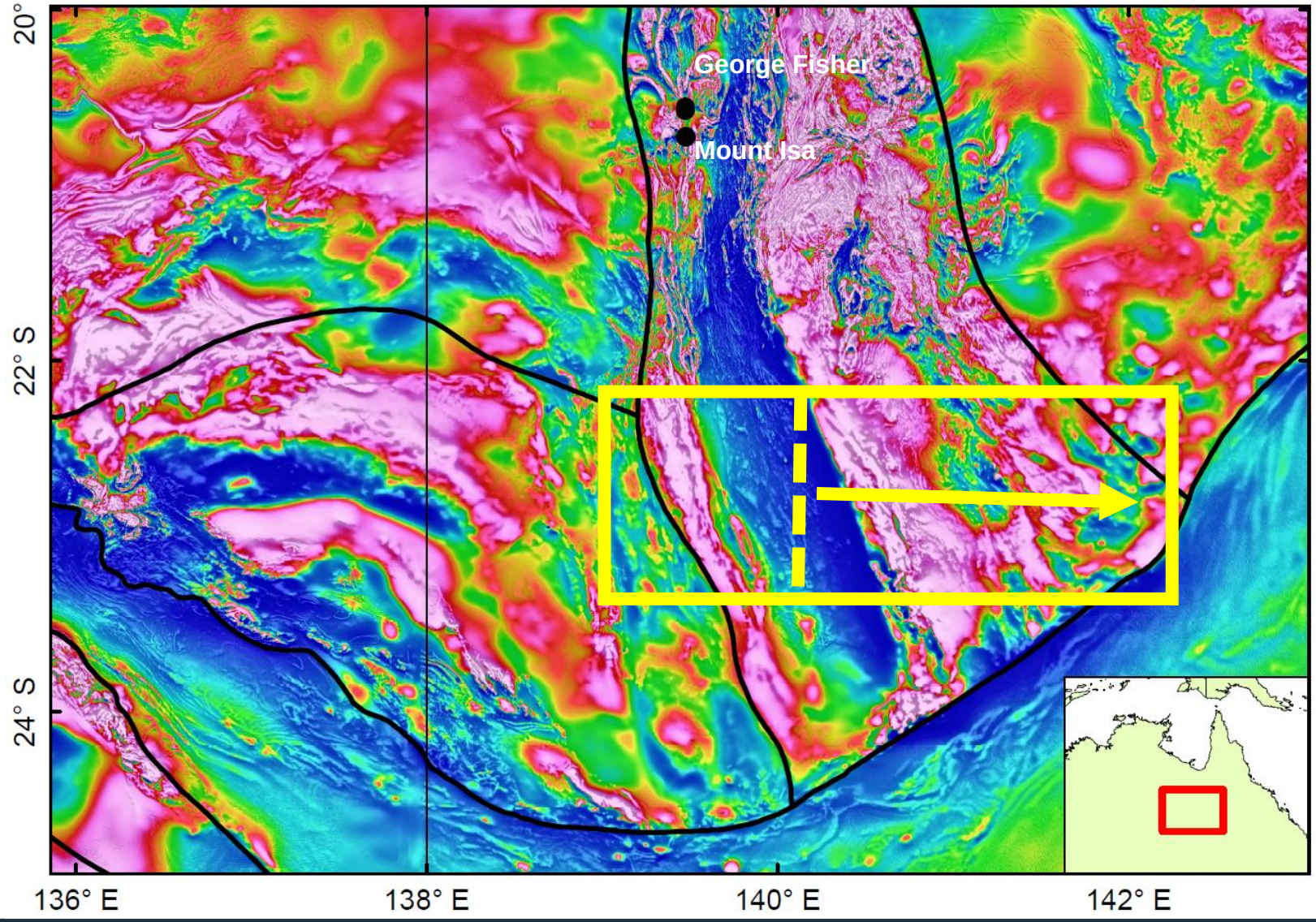


McCuaig and Hronsky, 2014

Regional trends - Basement

- N-S magnetic strata
- Along strike from major deposits (?)
- Major crustal boundaries (?)



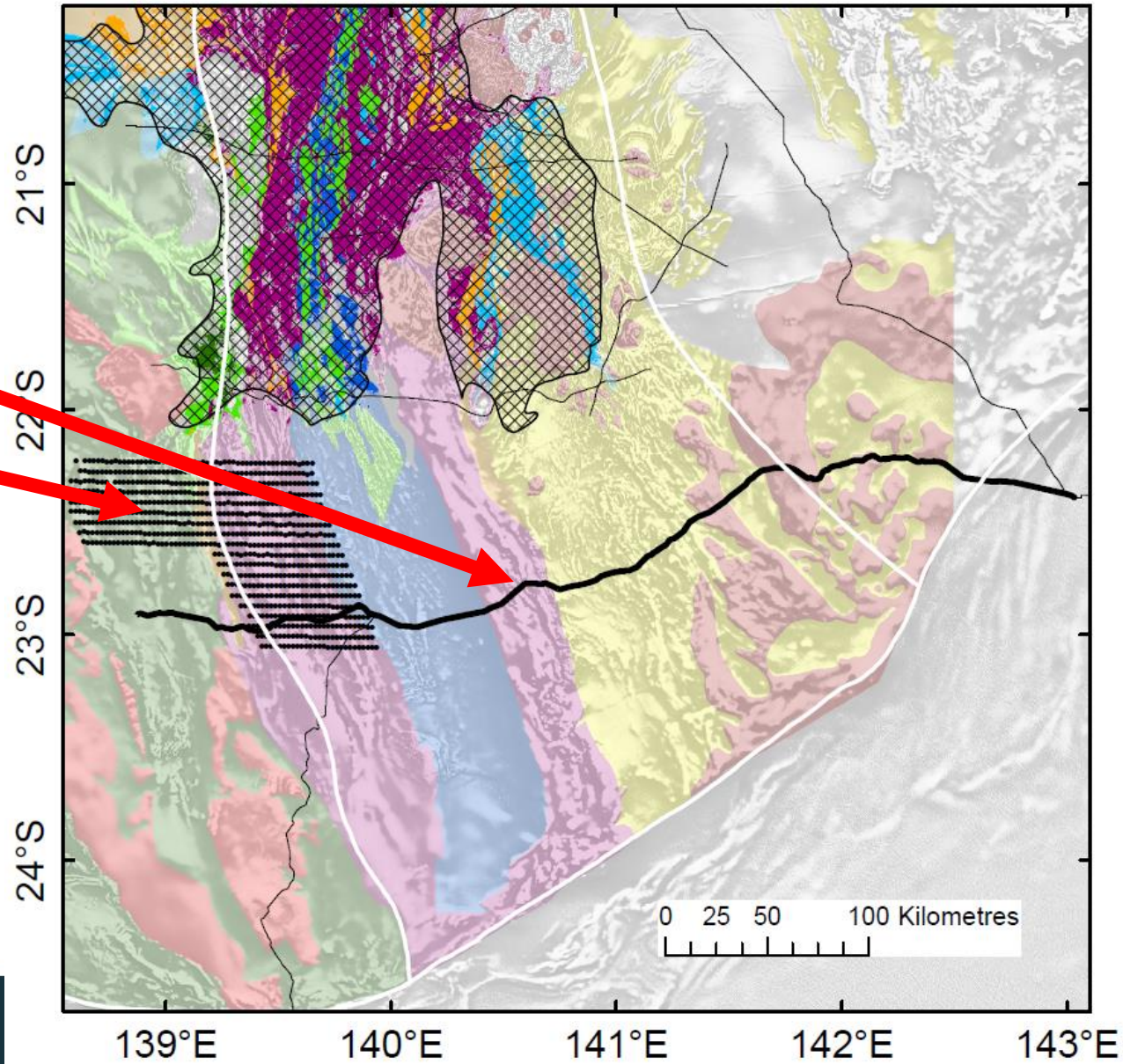
Open questions and available data

- Deep structures?
- Cover depth?

- Deep crustal seismic data
- Magnetotelluric data

  - Seismic + gravity

  - MT + seismic



Current understanding

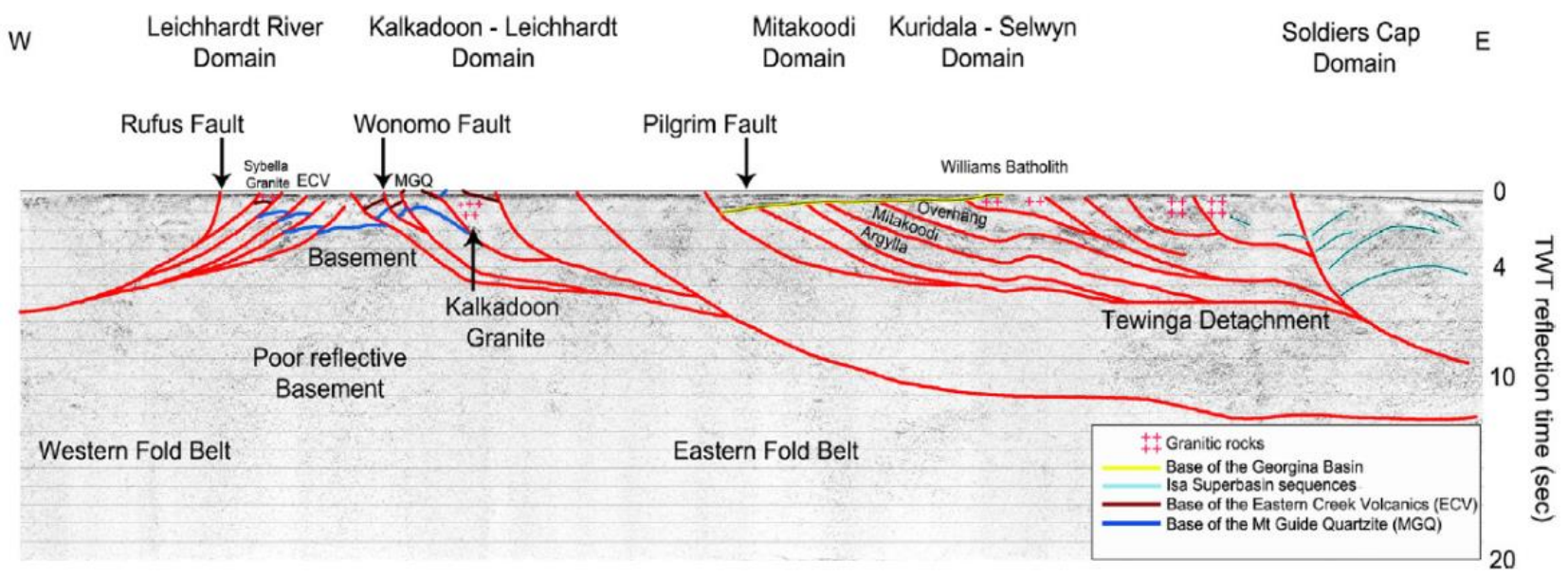
Various models

Potential terrane boundaries

Major features:

- Western Mount Isa boundary (?)

Korsch et al. 2008



Current understanding

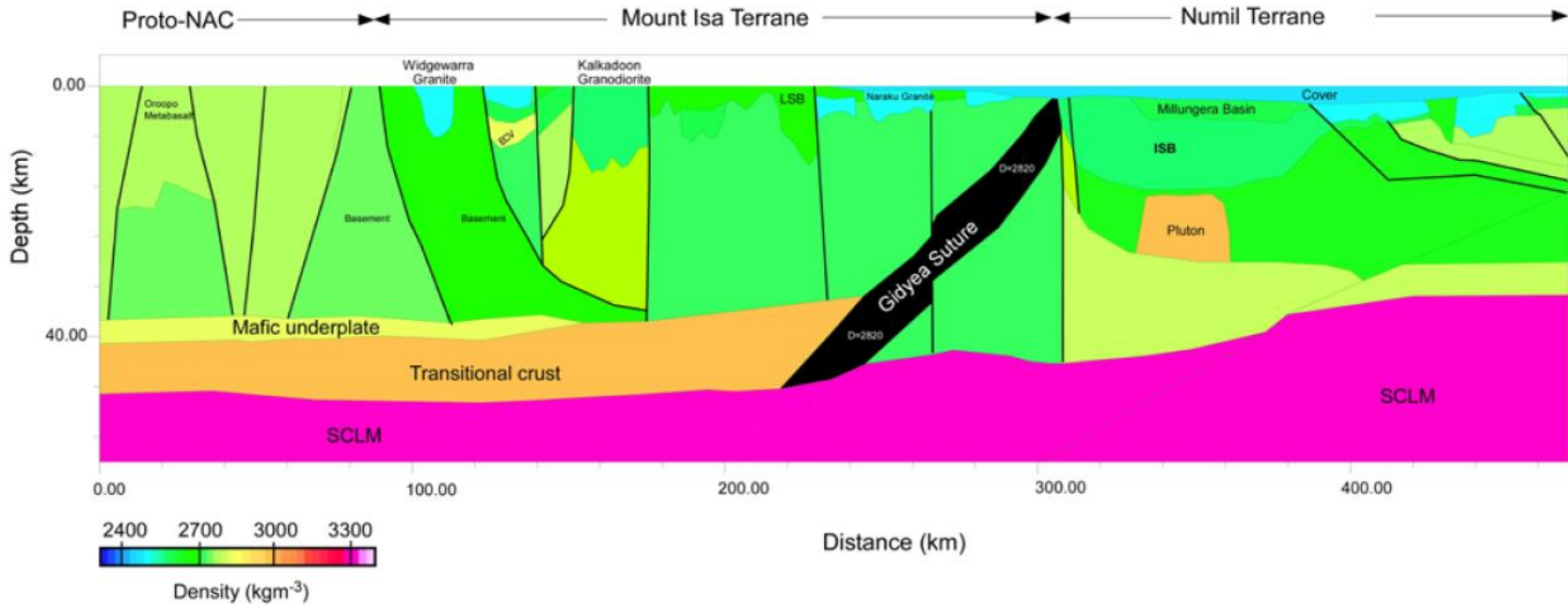
Various models

Potential terrane boundaries

Major features:

- Western Mount Isa boundary (?)
- Gidyea stuture 1740 Ma (?)

Betts et al. 2016

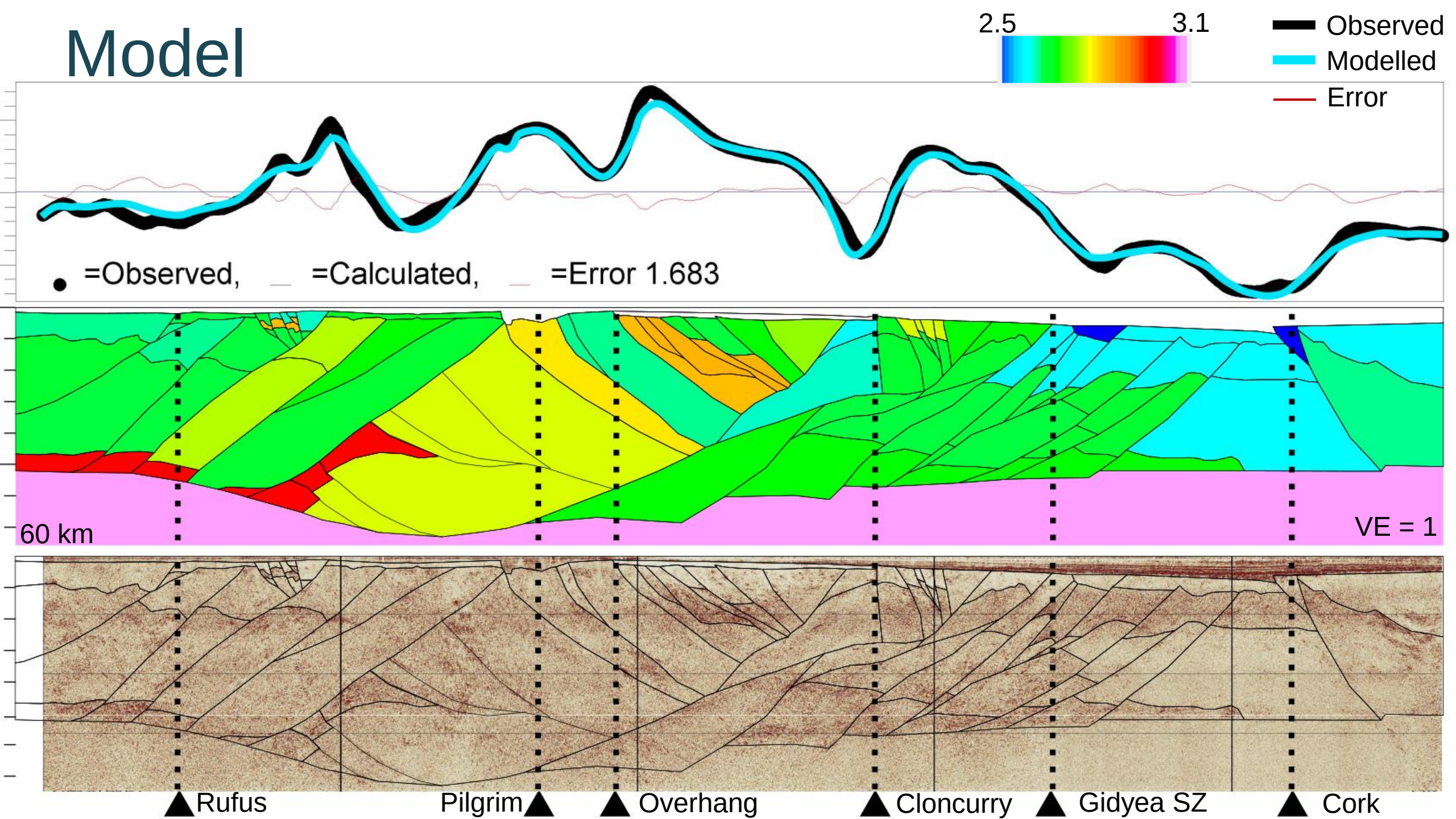


Seismic project aims

- Continuation of large-scale features undercover
- Western extent of Leichhardt/Mount Isa superbasins
- Major structures

➢ **Seismic interpretation and gravity modelling**

Model


2.5
3.1
Observed
Modelled
Error
=Observed,
=Calculated,
=Error 1.683
60 km
VE = 1
Rufus
Pilgrim
Overhang
Cloncurry
Gidyea SZ
Cork

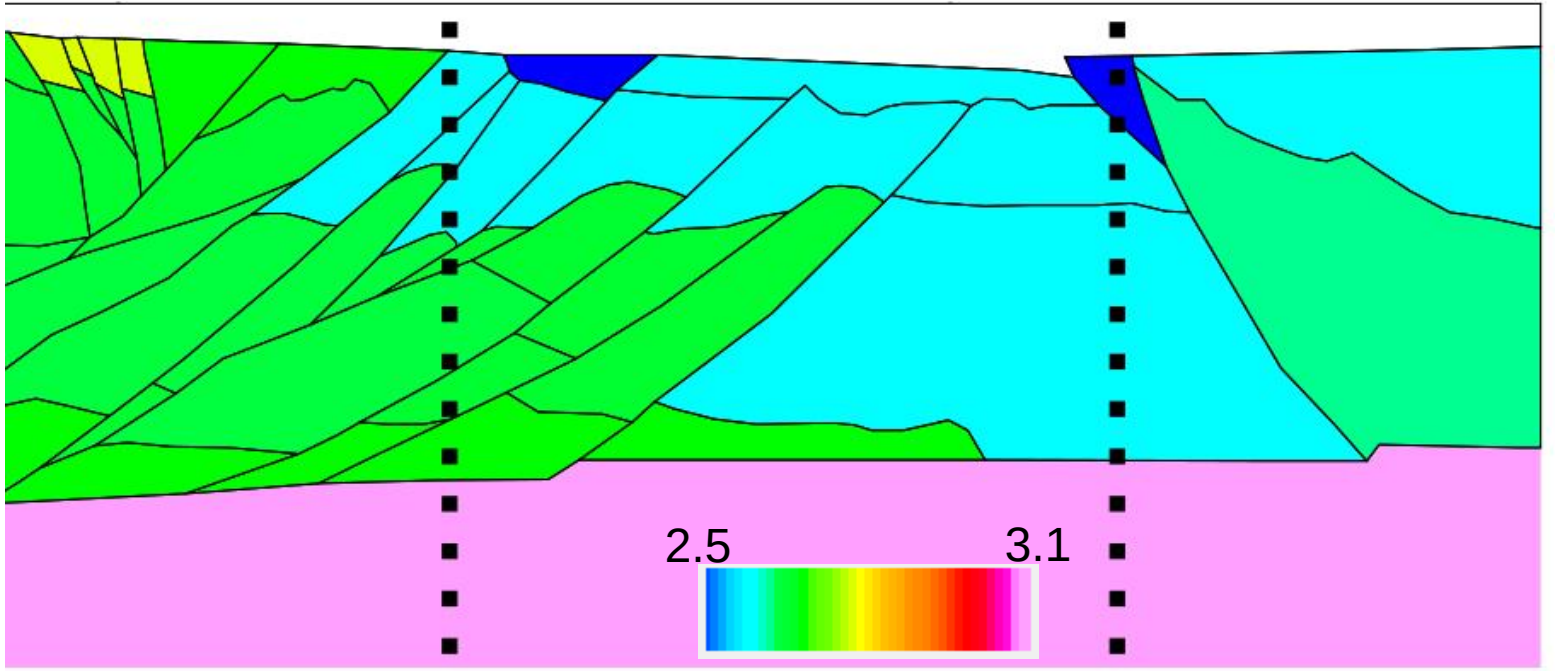
Features

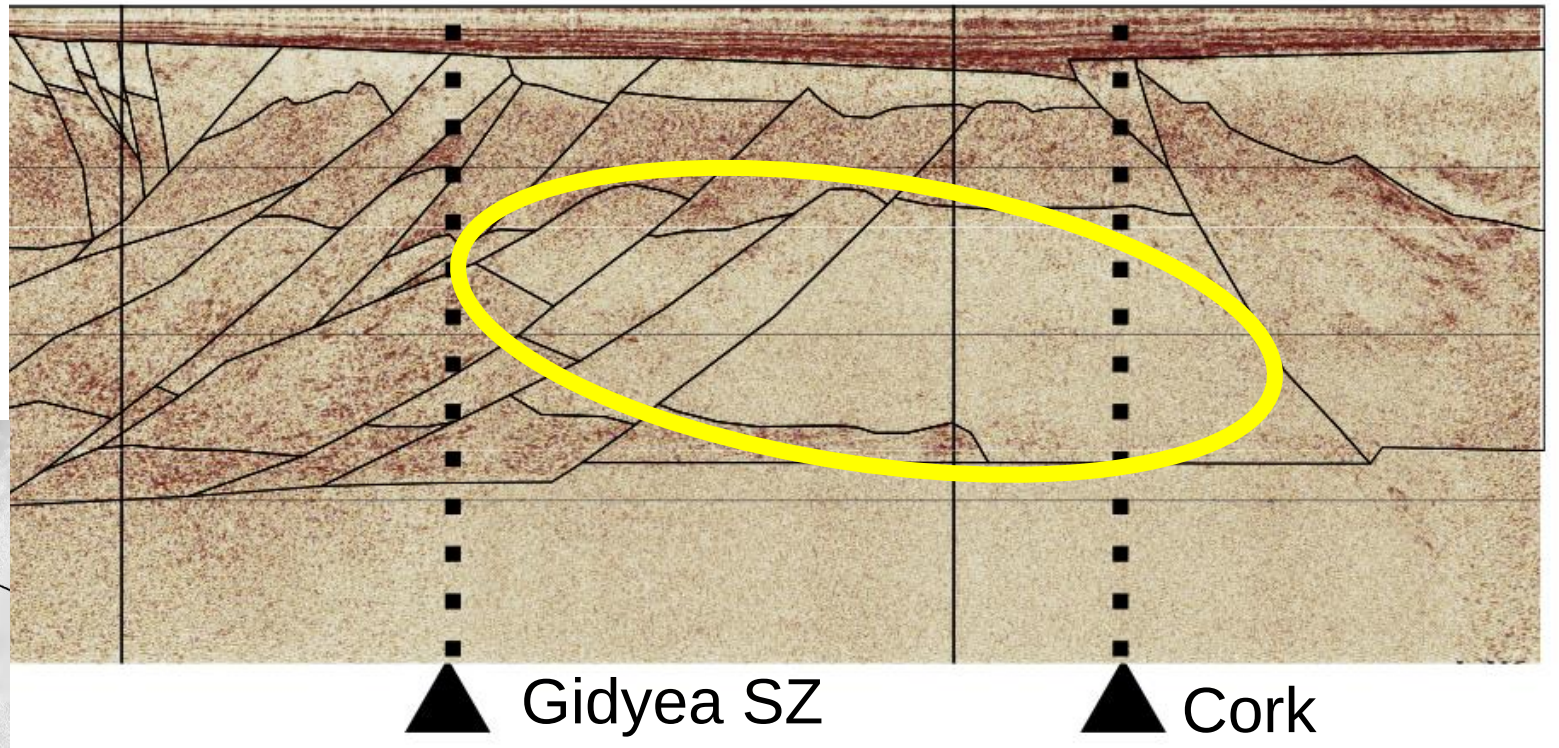
Difference in bulk crustal properties across GSZ

Bland lower crust

Recent reactivation along Cork Fault

Defined shallow Moho

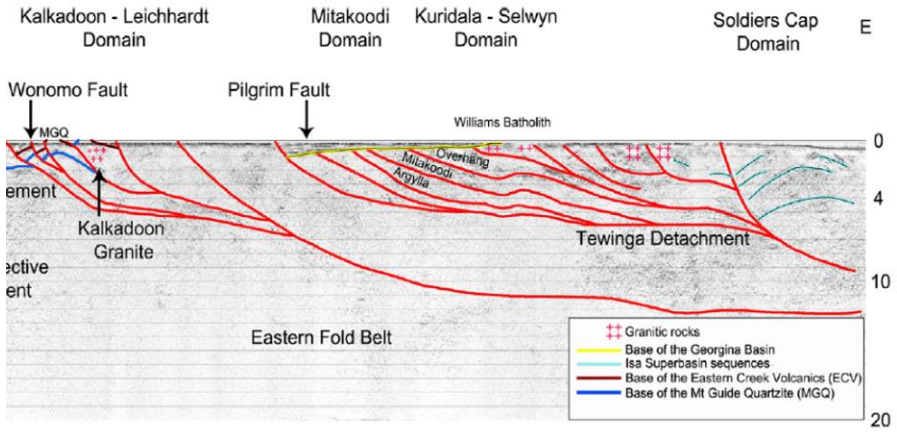


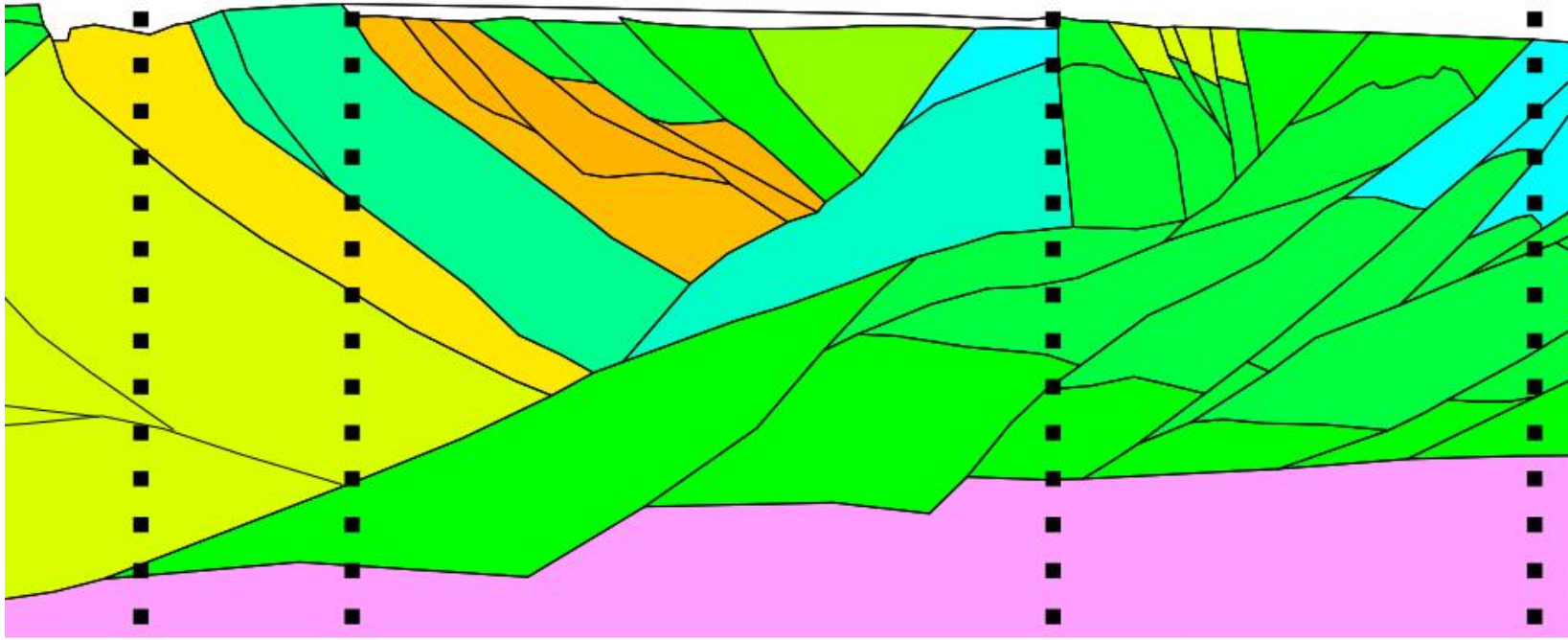


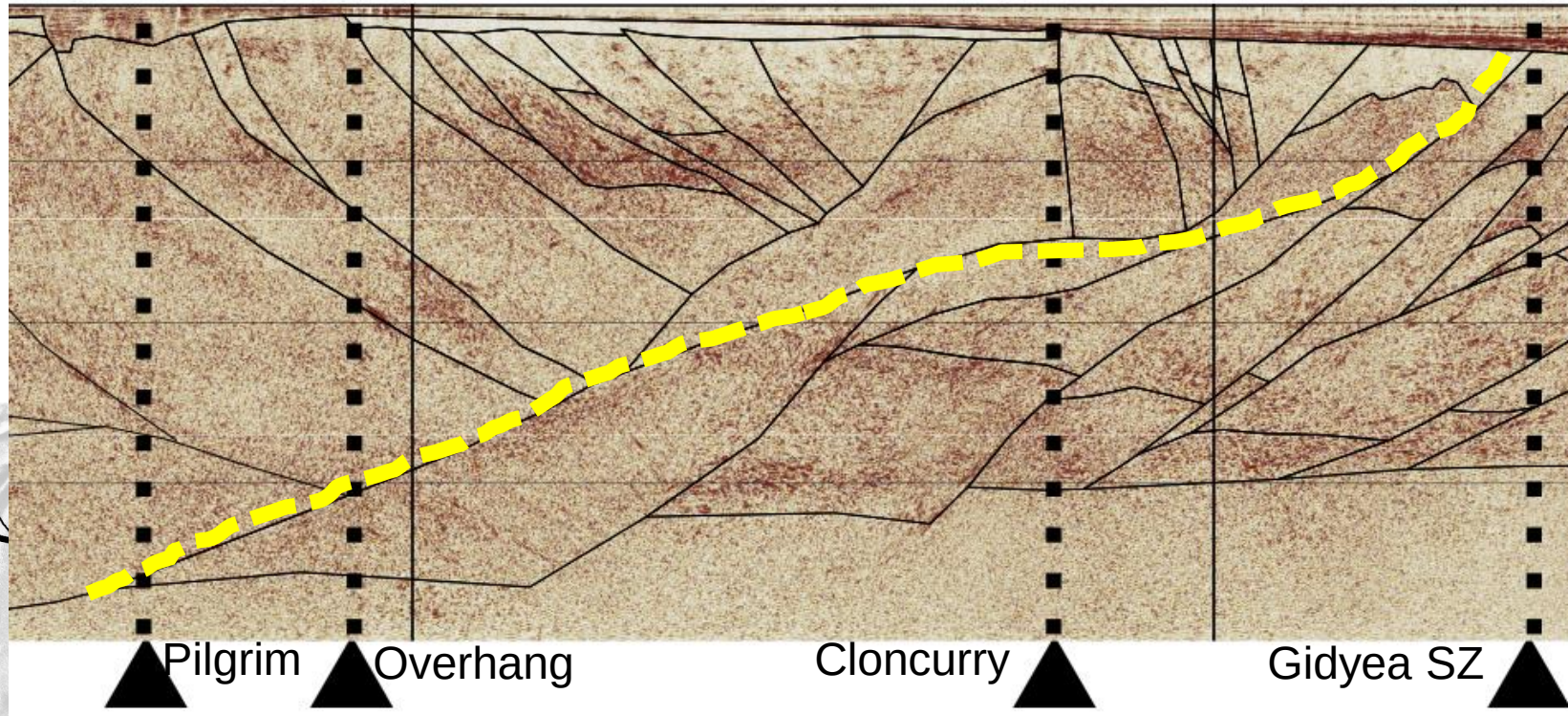
Features

GSZ complex/deformed

No evidence of east dipping detachment

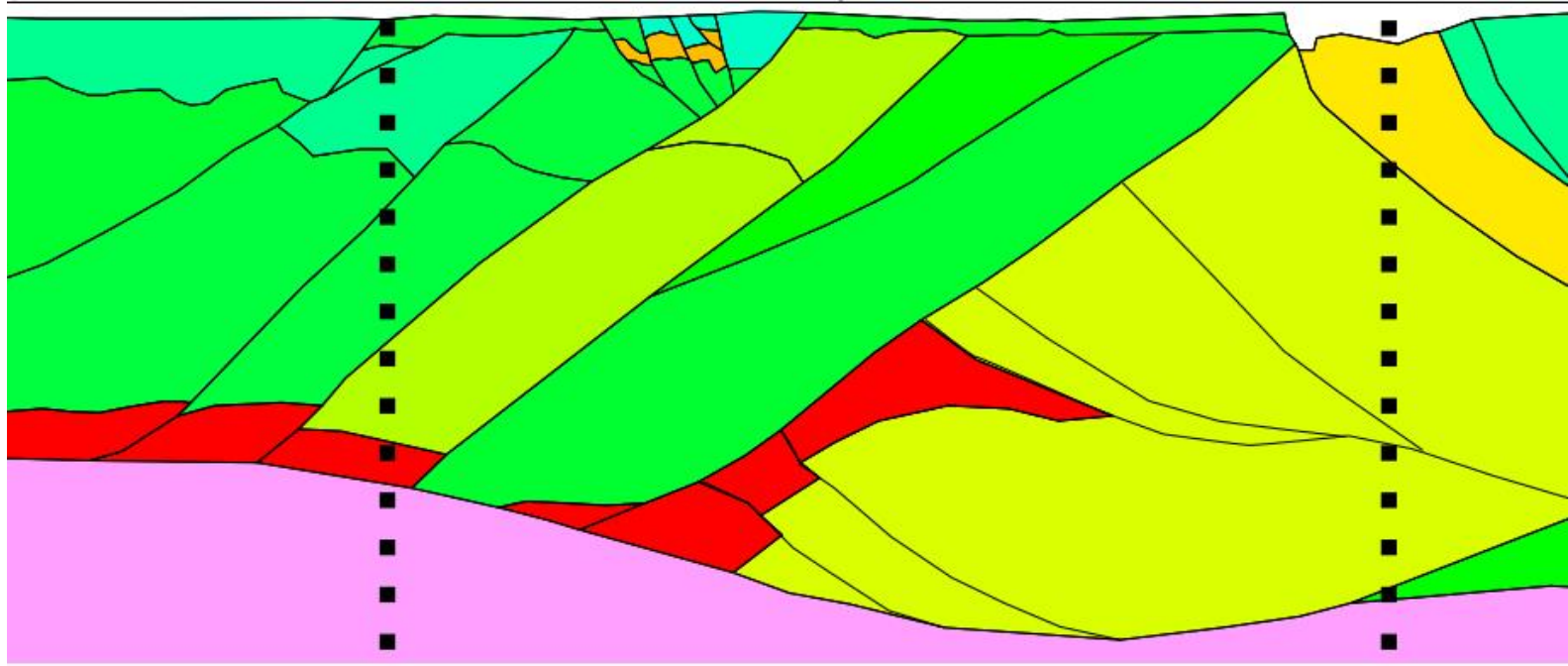


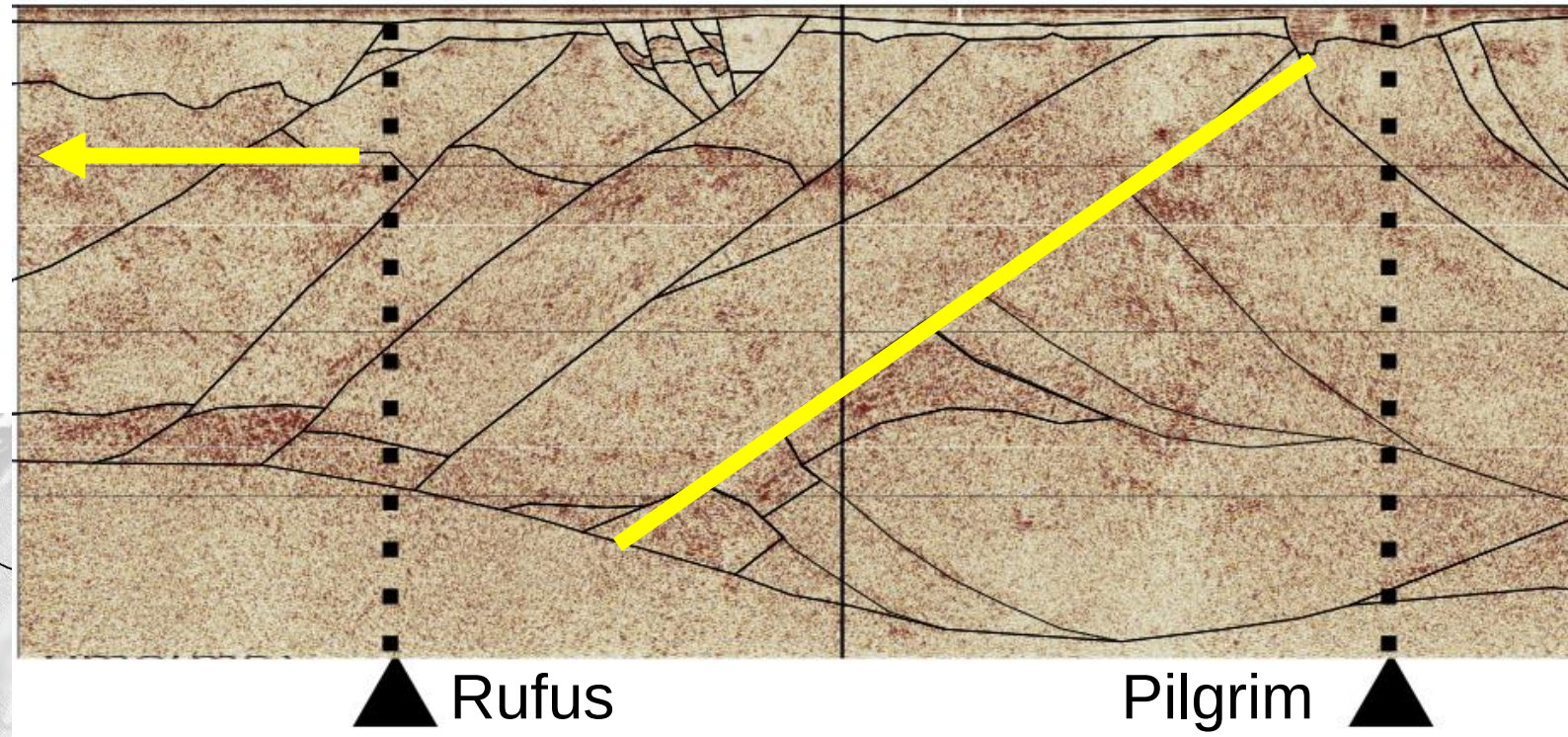




Features

- Thickened crust
- Change in crustal fabric
- Deformed reflective lower crust
- No evidence of change across Rufus Fault



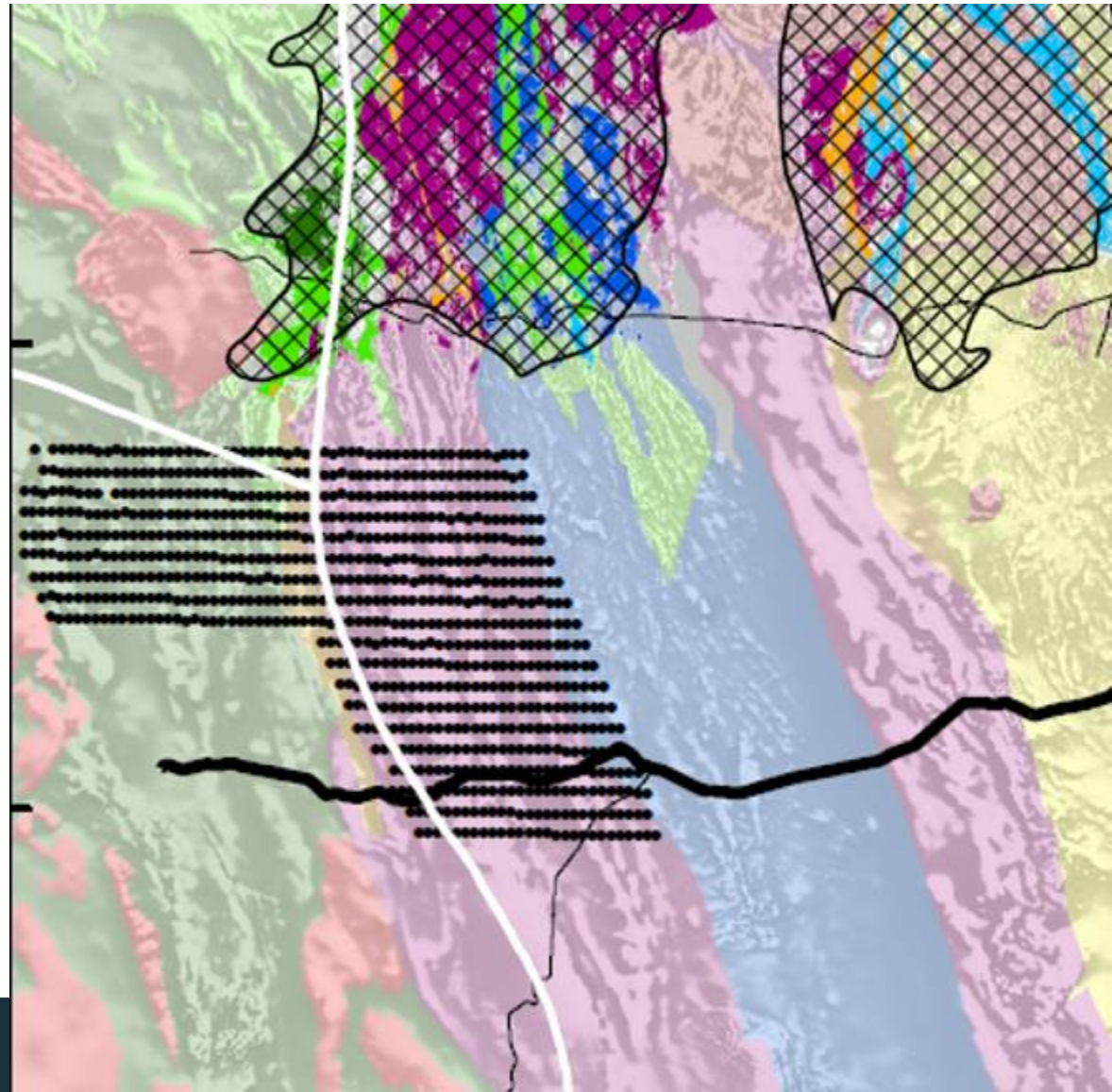


Additional insight from MT data

Basement depths – not discussed

Alteration/targeting

Broad trends



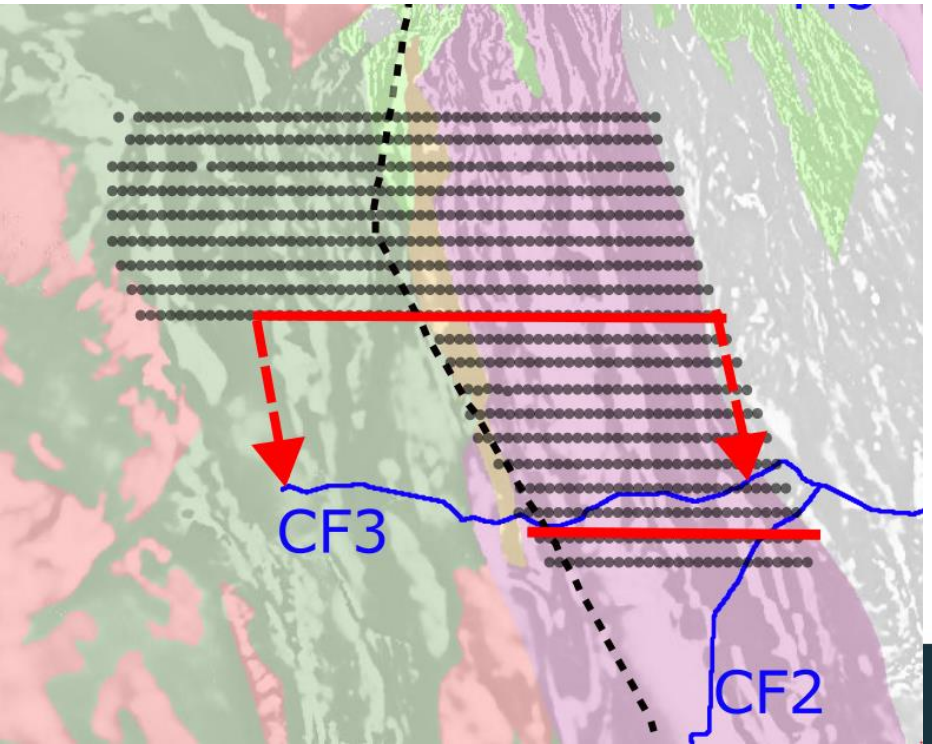
MT vs Seismic

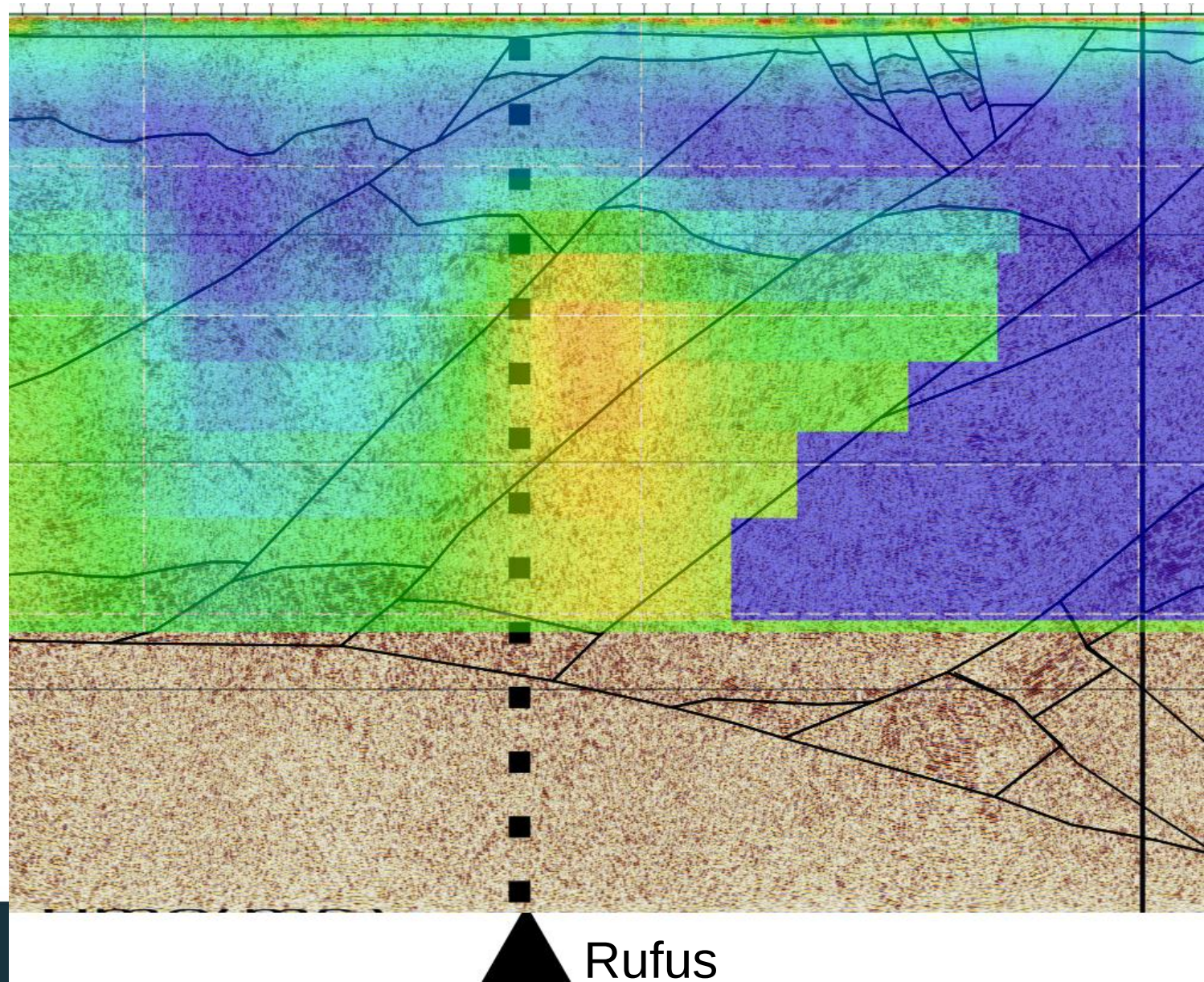
Conductive feature associated with faults

Present below ~12 km

hallmark of H+

Resistive to the east



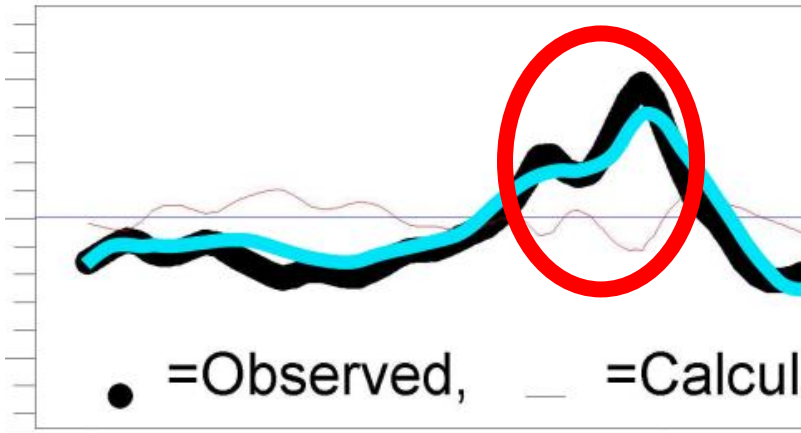


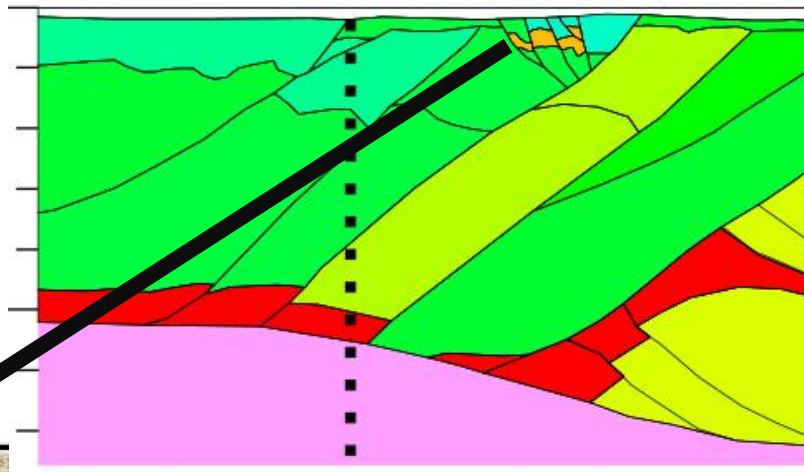
Combined understanding

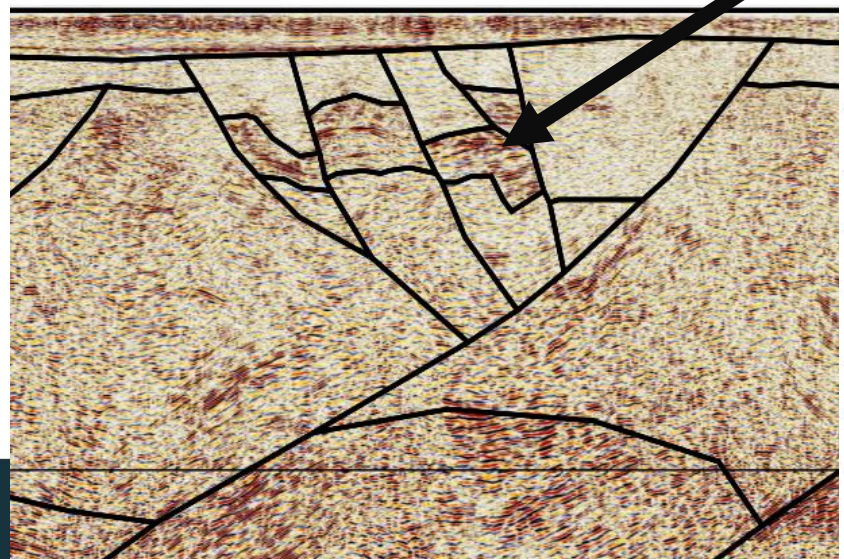
Shallow anomalous density

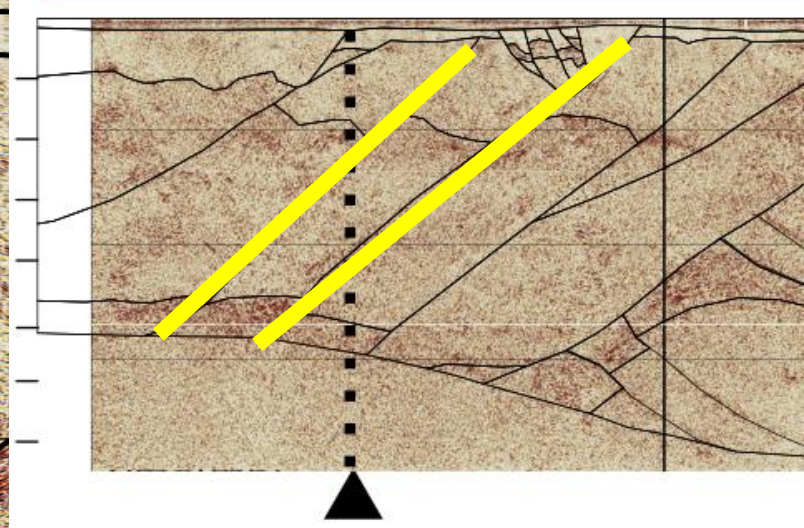
Deep penetrating faults associated with alteration

Orange unit interpreted to be ECV equiv.









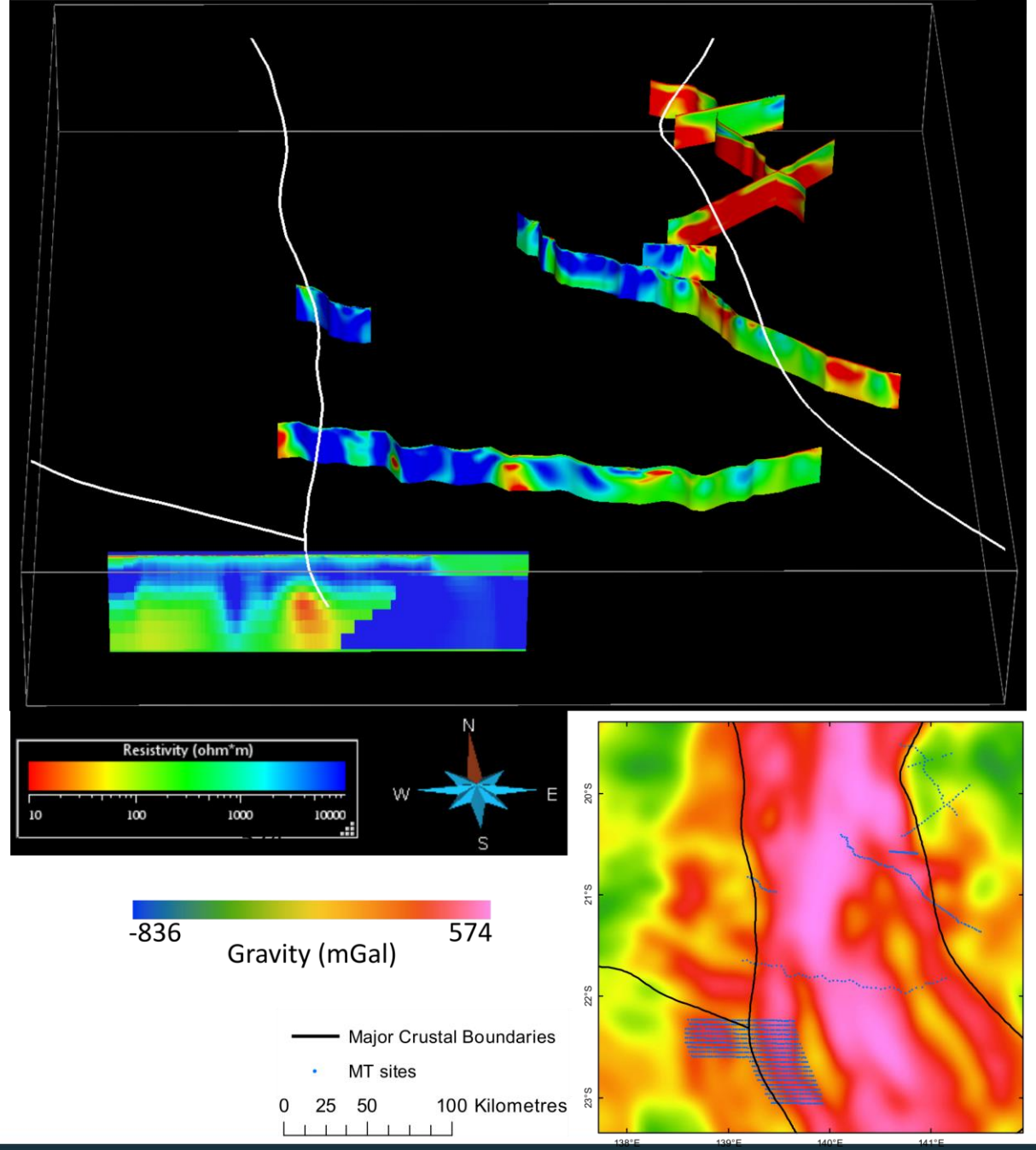
Broader trends

Resistive central belt

East – CCA

West – suggested decrease in resistivity

AusLAMP



Take home points

Integration of different geophysical techniques is key in poorly understood areas

Thickened crust and suturing present near Pilgrim Fault

Gidyea Suture Zone present in southern Isa

Seismic, gravity and MT together suggest alteration of deep penetrating structures in the southern Mount Isa Province

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Questions?

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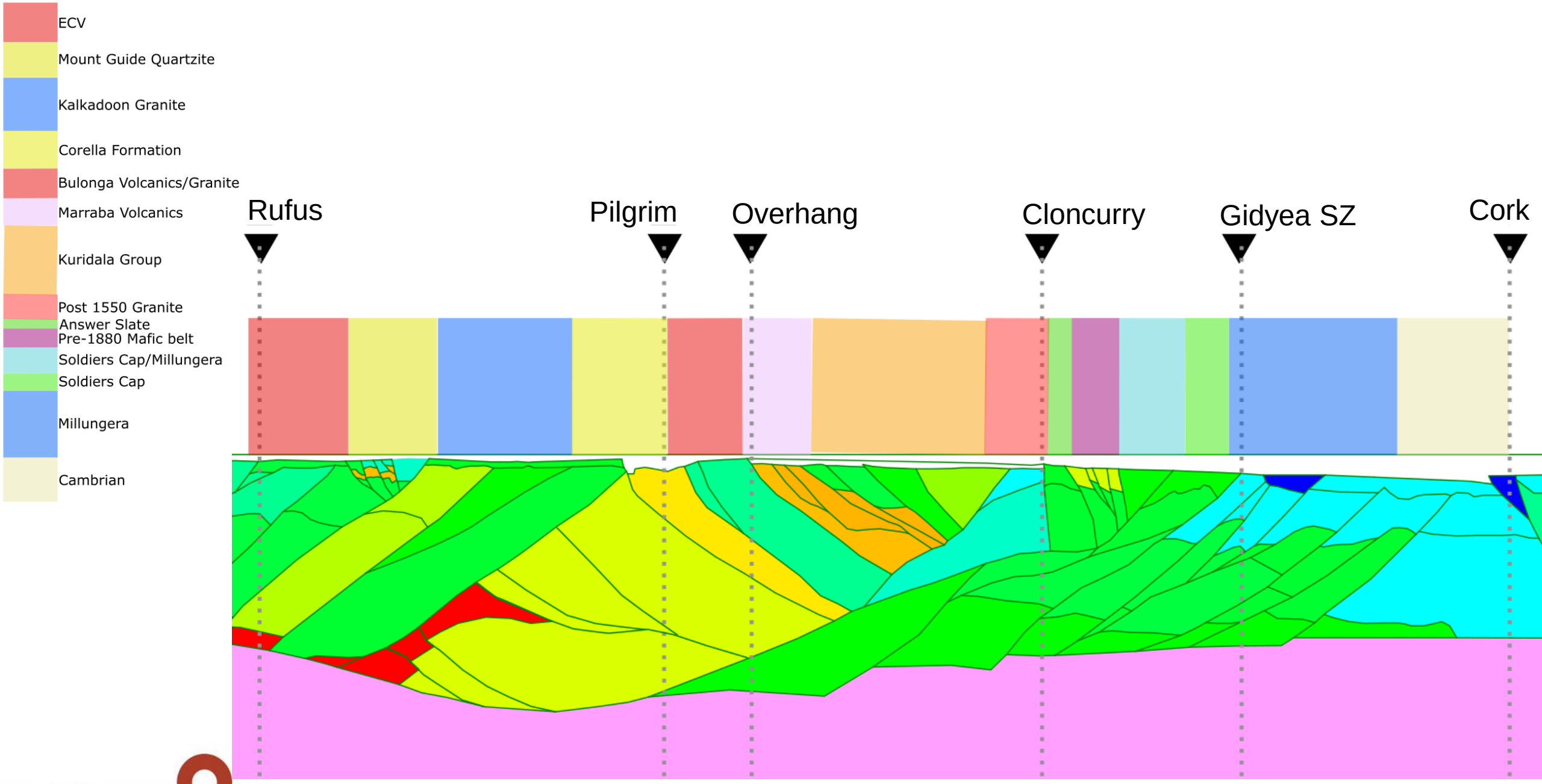
ECV
Mount Guide Quartzite
Kalkadoon Granite
Corella Formation
Bulonga Volcanics/Granite
Marraba Volcanics
Kuridala Group
Post 1550 Granite
Answer Slate
Pre-1880 Mafic belt
Soldiers Cap/Millungera
Soldiers Cap
Millungera
Cambrian
Rufus
Pilgrim
Overhang
Cloncurry
Gidyea SZ
Cork