What's new in Coonabarabran?

Latest results from airborne geophysics, geological mapping and collaborative drilling

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Department of Planning and Environment

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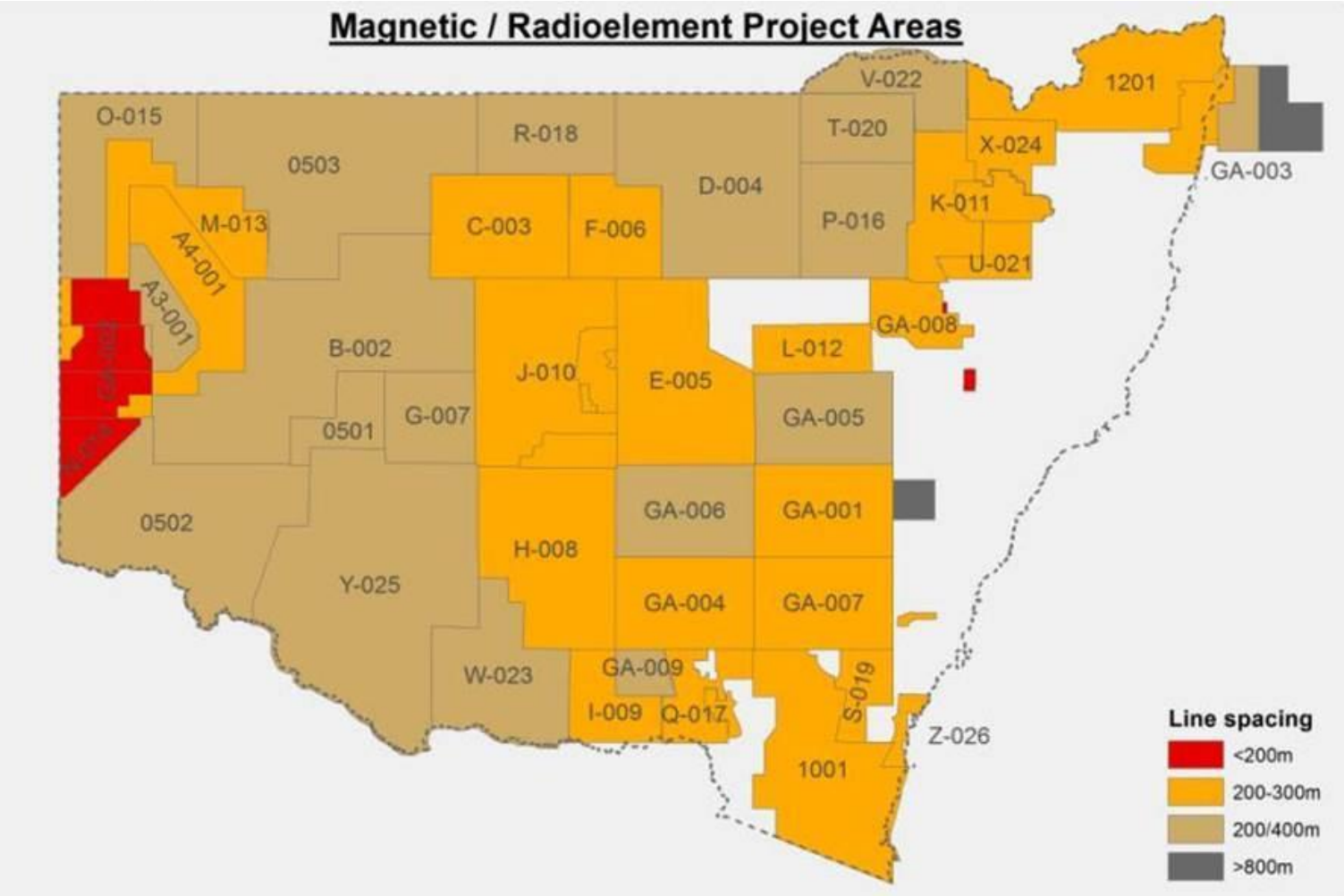

Why Coonabarabran?

- Gap in aeromagnetics coverage
- Northern extension of Macquarie Arc
- New mapping project in Warrumbungle National Park

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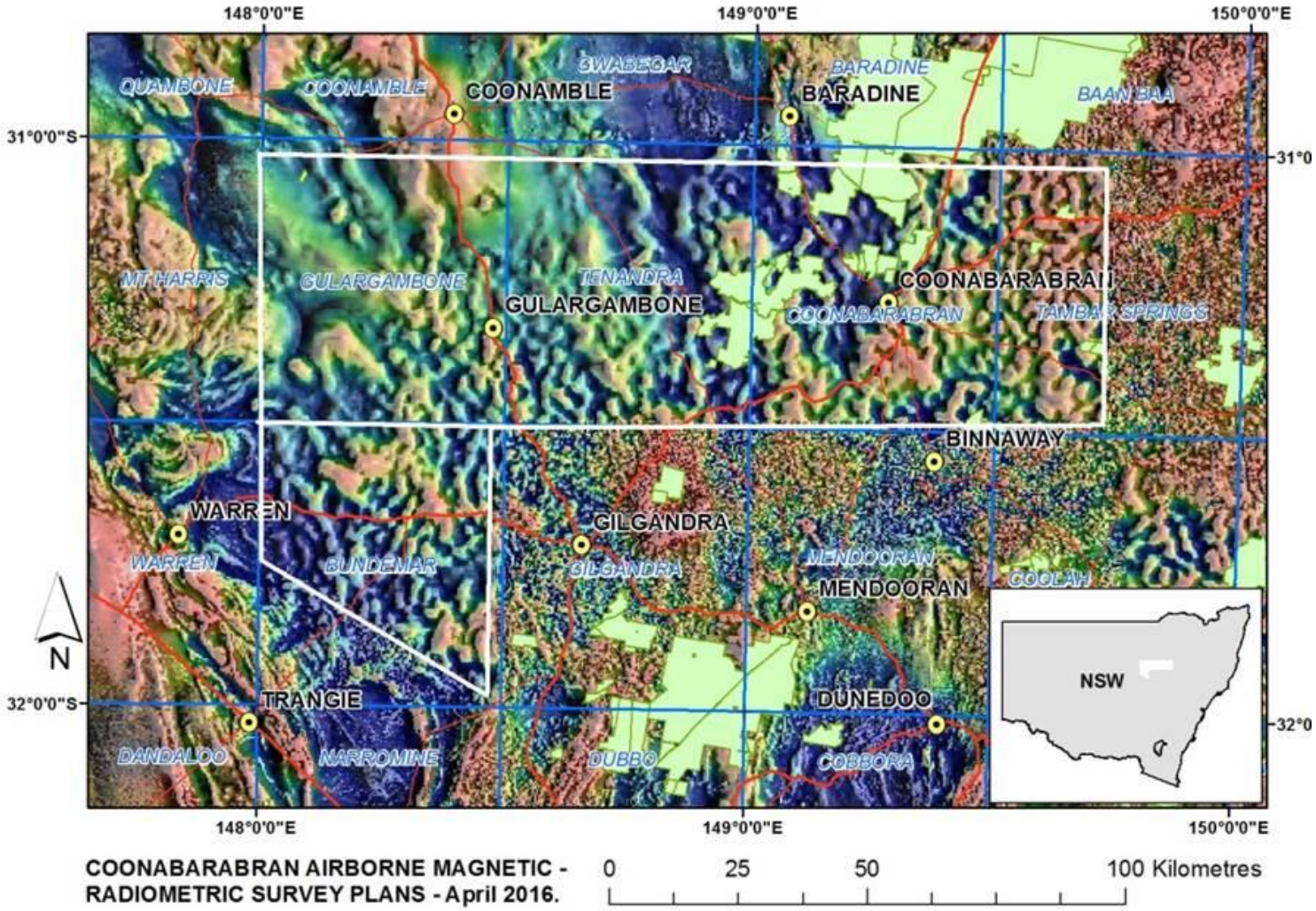

The survey

- 250m line spacing and 60m terrain clearance
- East-west lines
- Rugged terrain in Warrumbungle National Park
- Funded by New Frontiers
- Acquisition being managed by GA under a NCF agreement
- Data now available!

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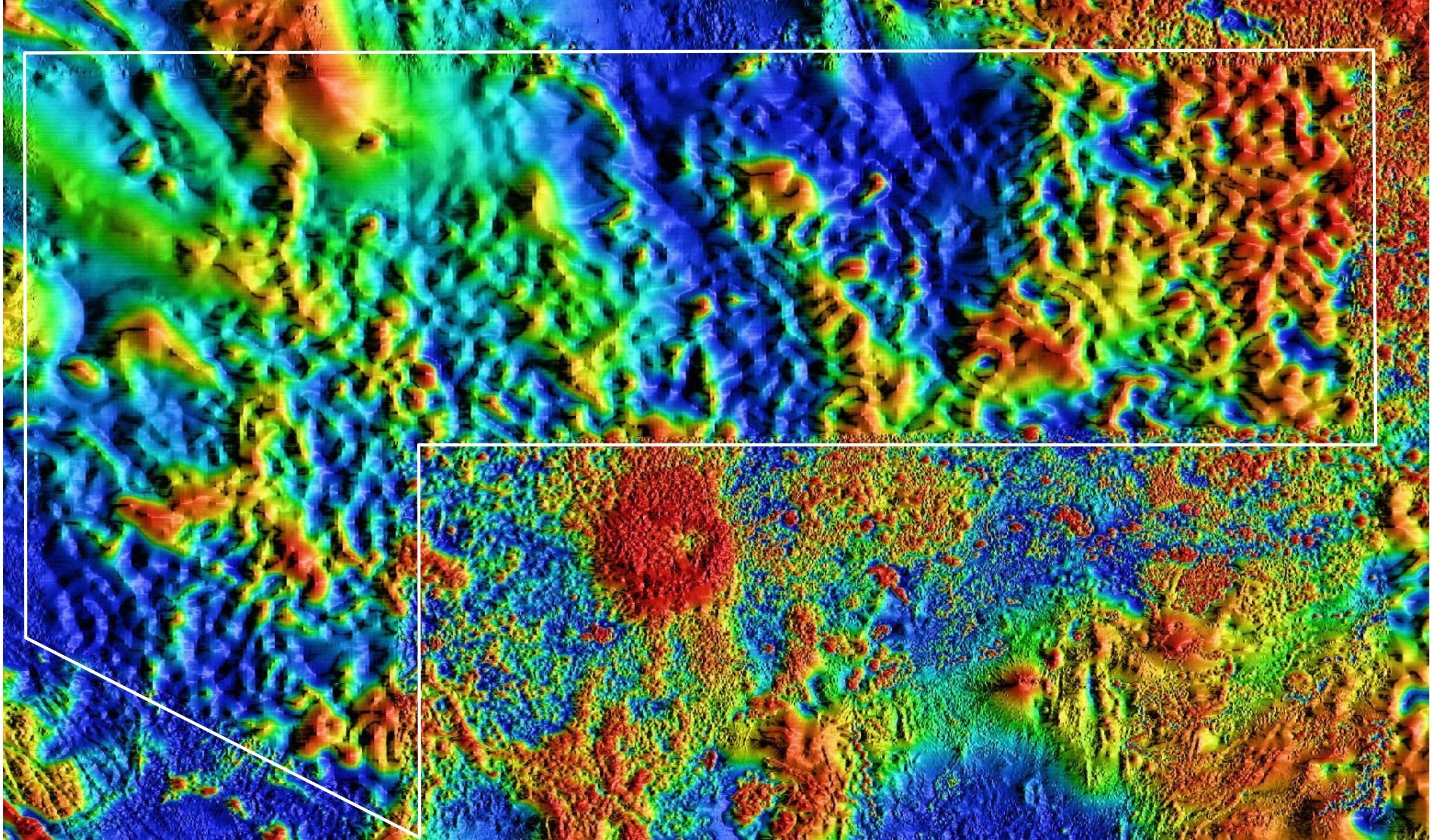
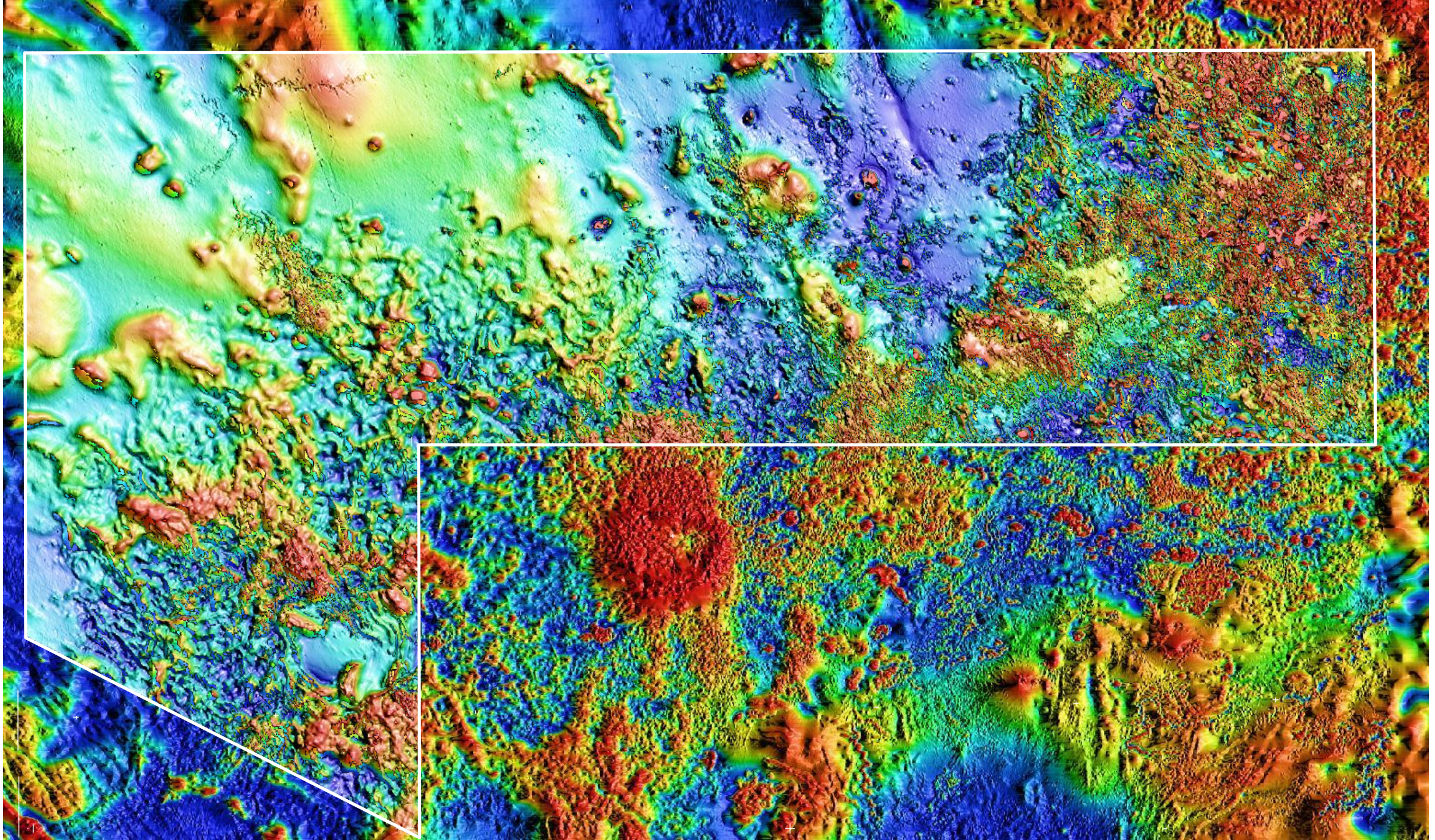
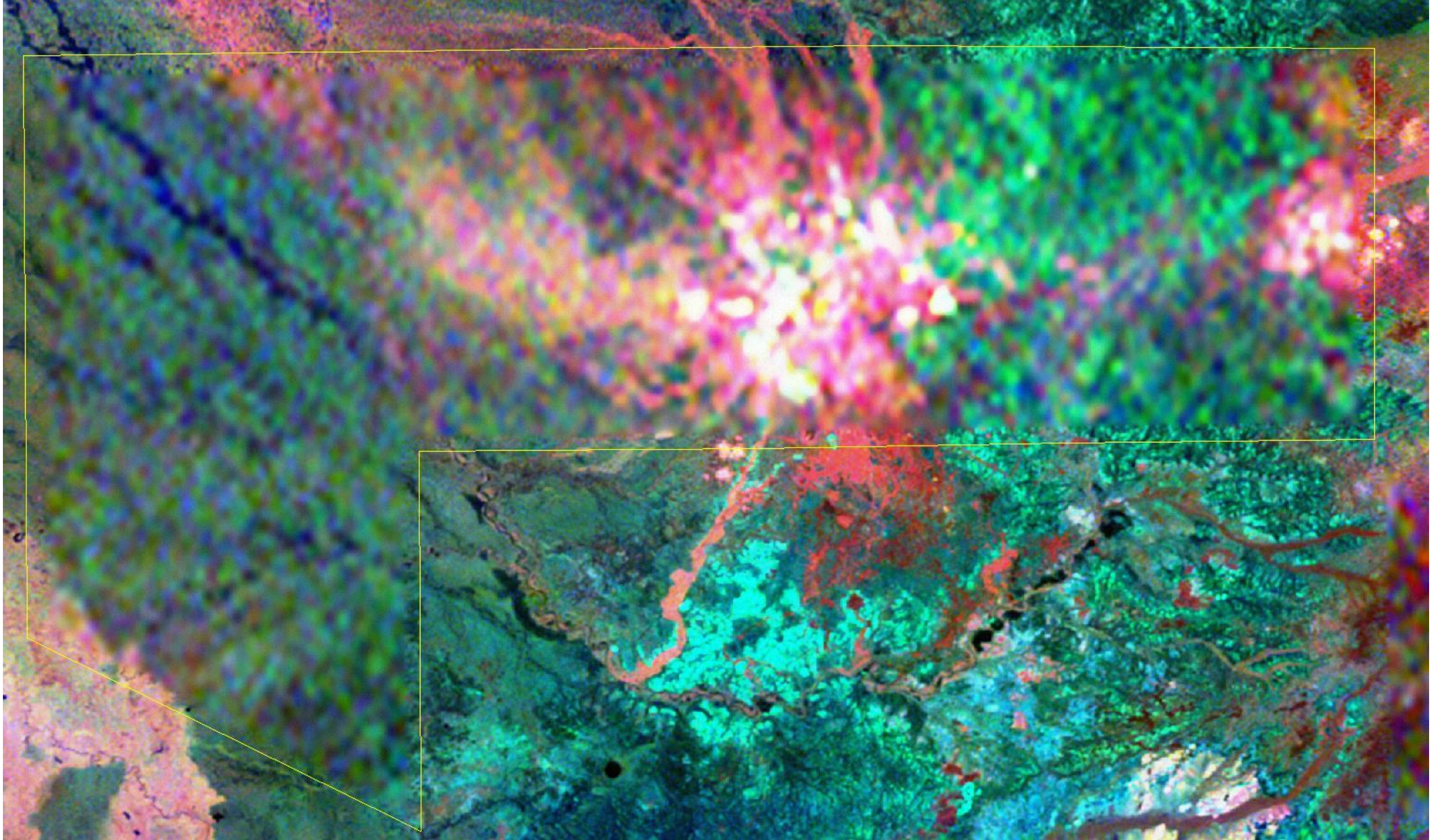
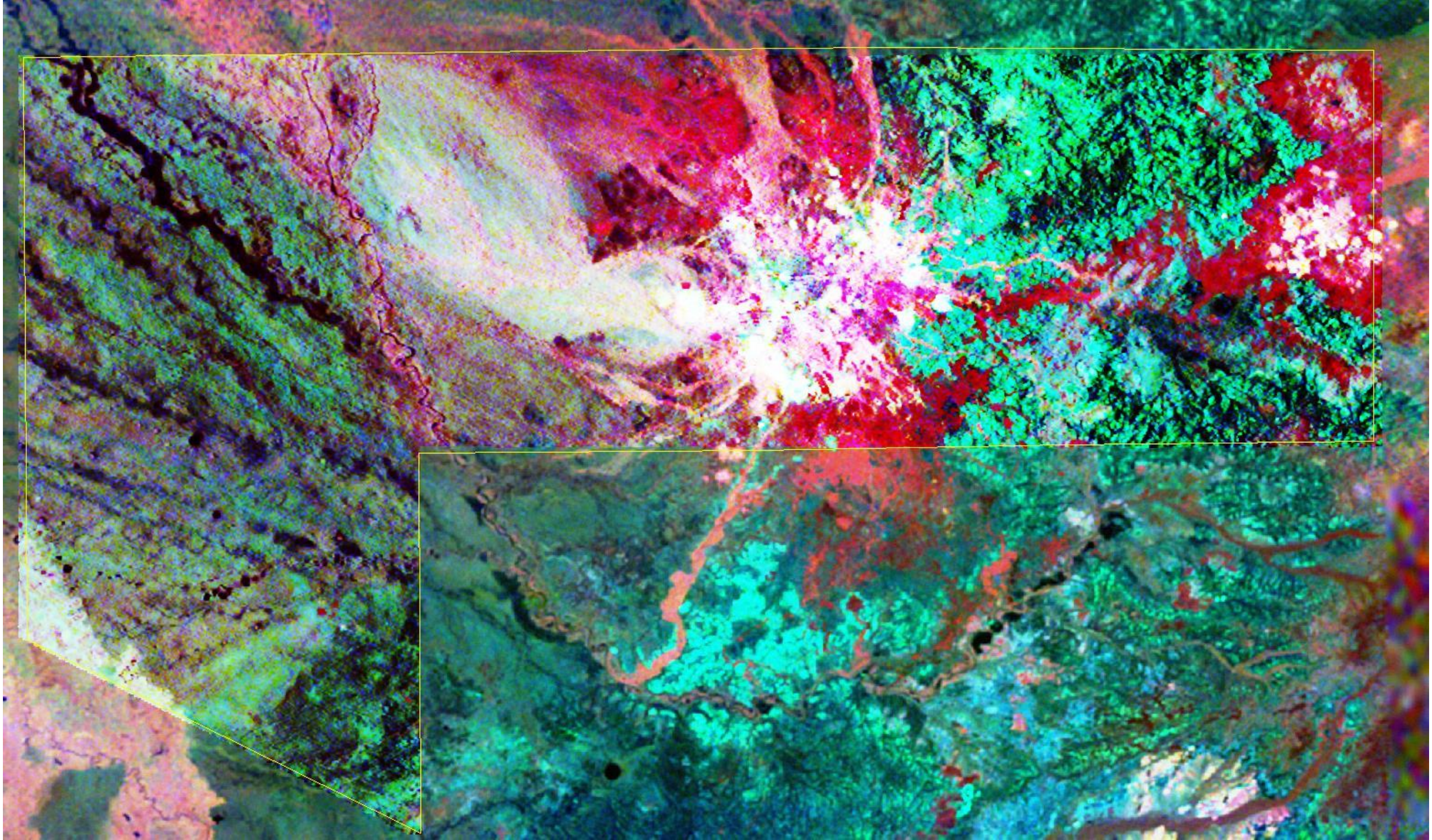
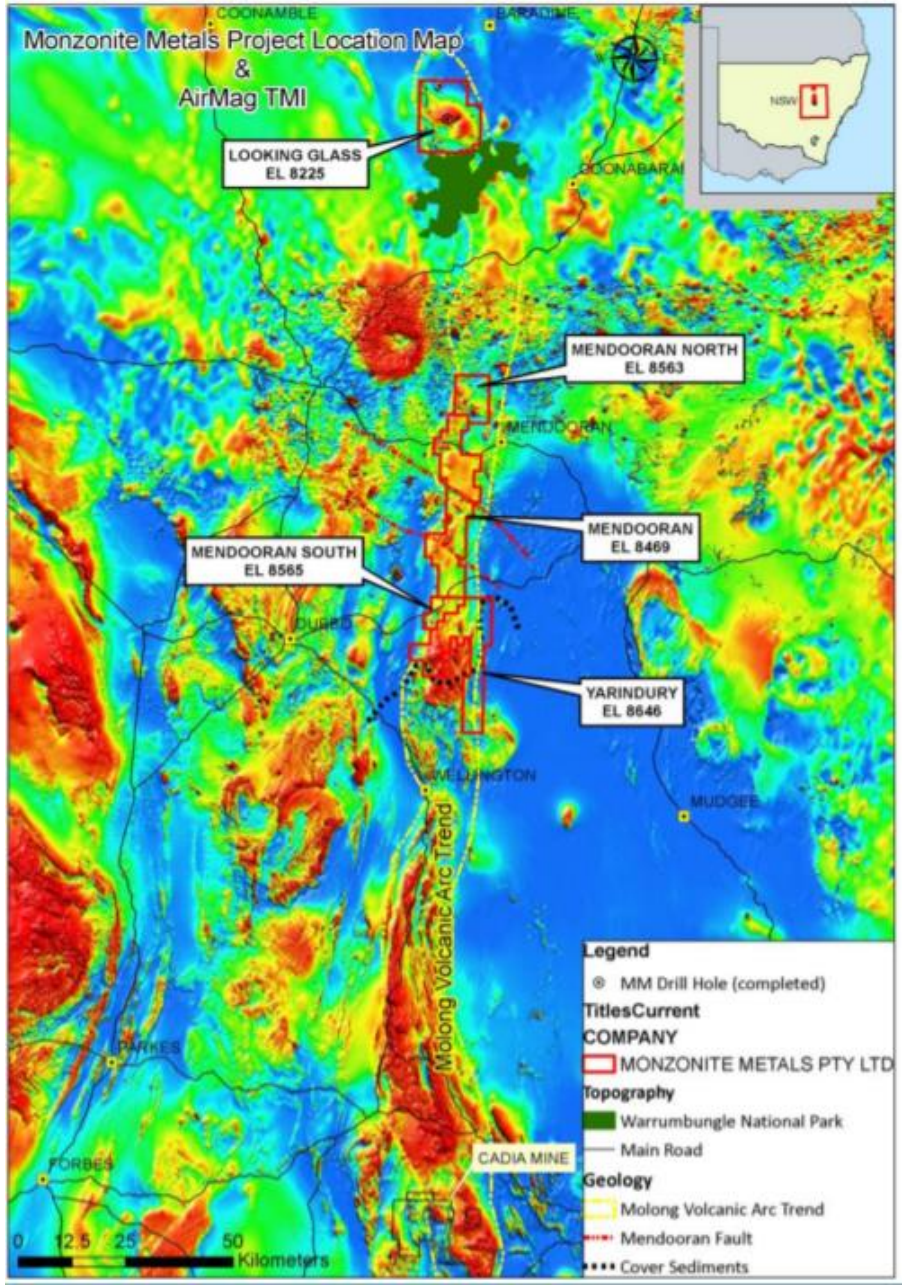






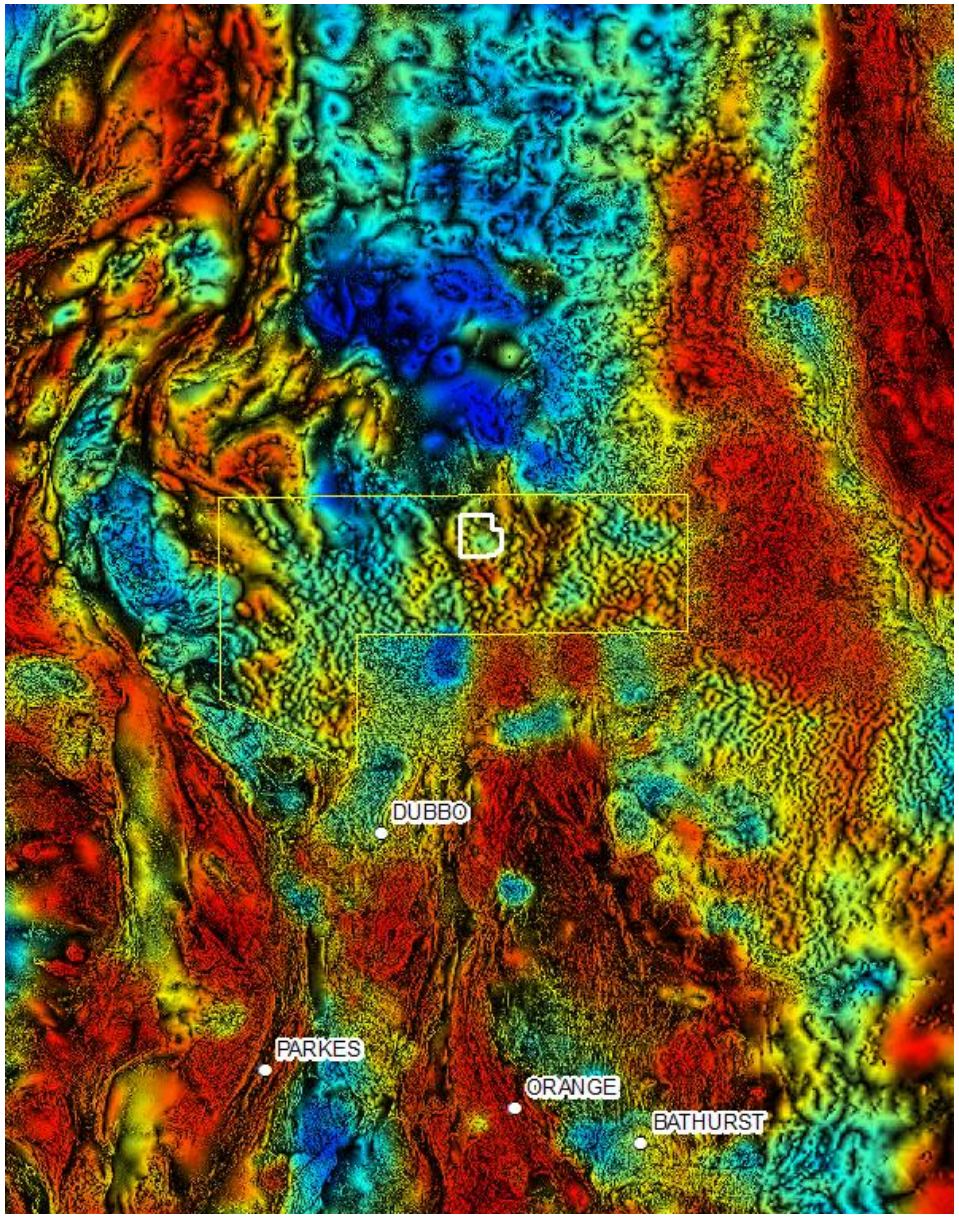




Cooperative Drilling of Molong Volcanic Belt

- Study area is interpreted to be underlain by the Molong Volcanic Belt of the Macquarie Arc
- In 2016 Alice Queen Holdings Pty Ltd won bid for co-op drilling grant to drill magnetic targets in basement
- They flew their own 250m/70m aeromag for targeting
- 1st hole intersected geochemically evolved, Carboniferous andesitic volcanic rocks

Source: Alice Queen Holdings Pty Ltd, Investor - Update Oct 2017



Carboniferous volcanics!?

- Andesitic Carboniferous volcanic rocks west of the Tamworth Belt previously only found outcropping in the Pokolbin inlier near Maitland
- The new drilling extends interpreted Carboniferous volcanic arc 100 km west of ‘Conors-Auburn Arch’

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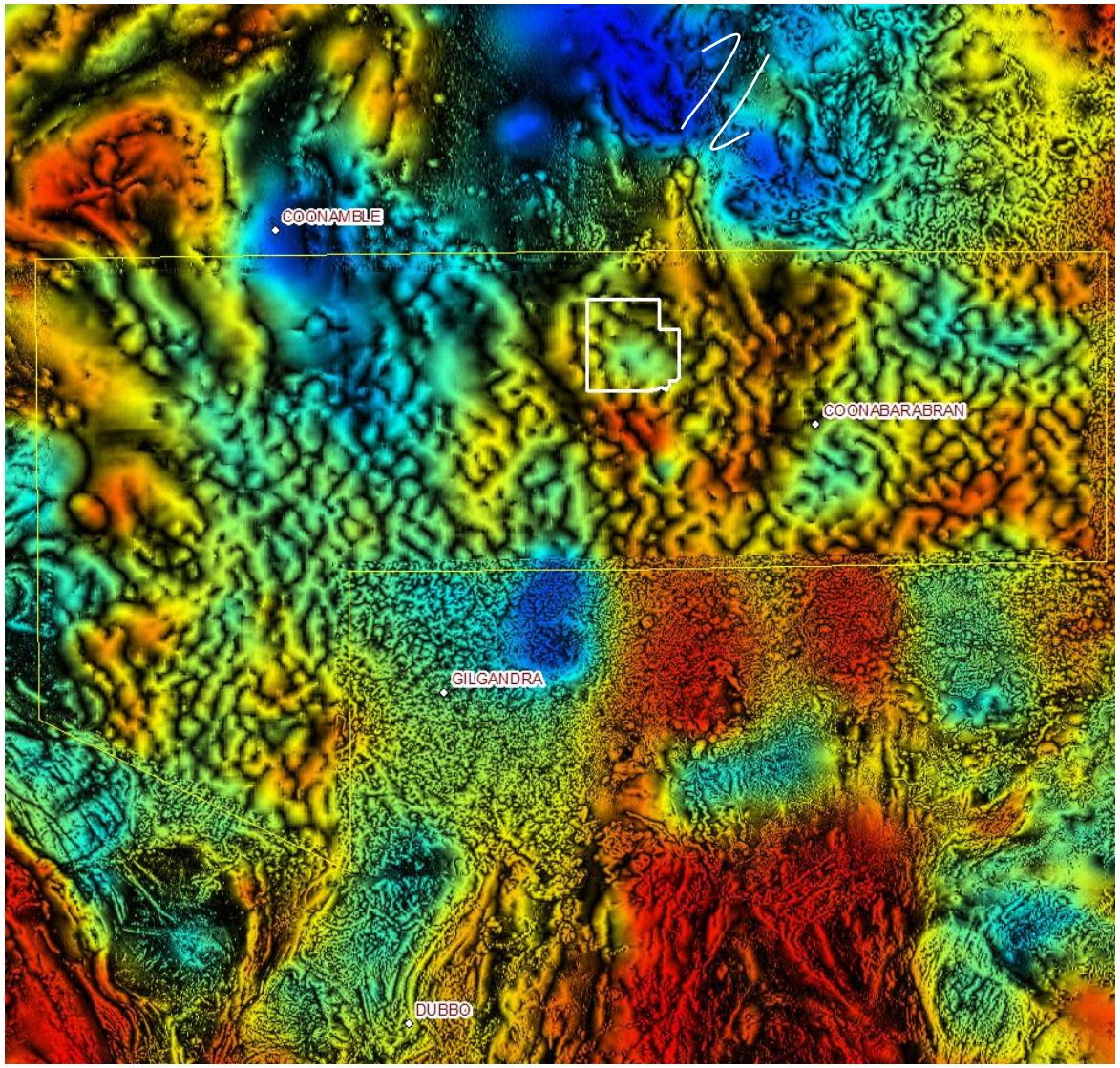

So where is the Molong Volcanic Belt?

- New magnetic data supports gravity interpretation suggesting Molong Belt is present in the survey area
- Eastern margin of belt defined by remanence anomaly
- Northern margin cut by NE-trending dextral-reverse fault
- This fault may define northern limit of explorable depth

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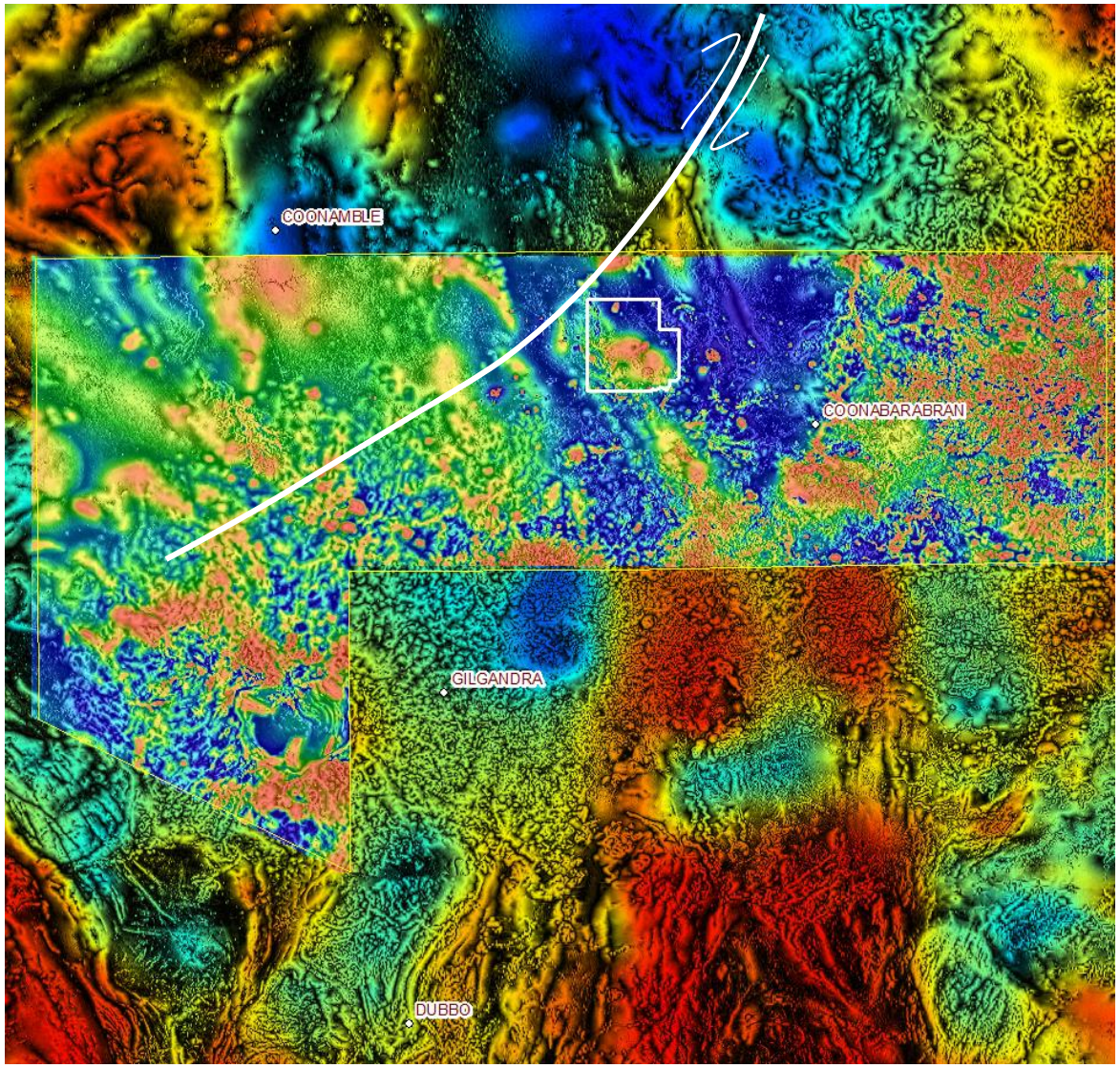

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Warrumbungle NP

- 2013 bushfire destroyed much of the park, including Visitors Centre
- NPWS started project to understand bush recovery and rebuild centre
- This included working with GSNSW to improved geological mapping and build a 3D model of the park

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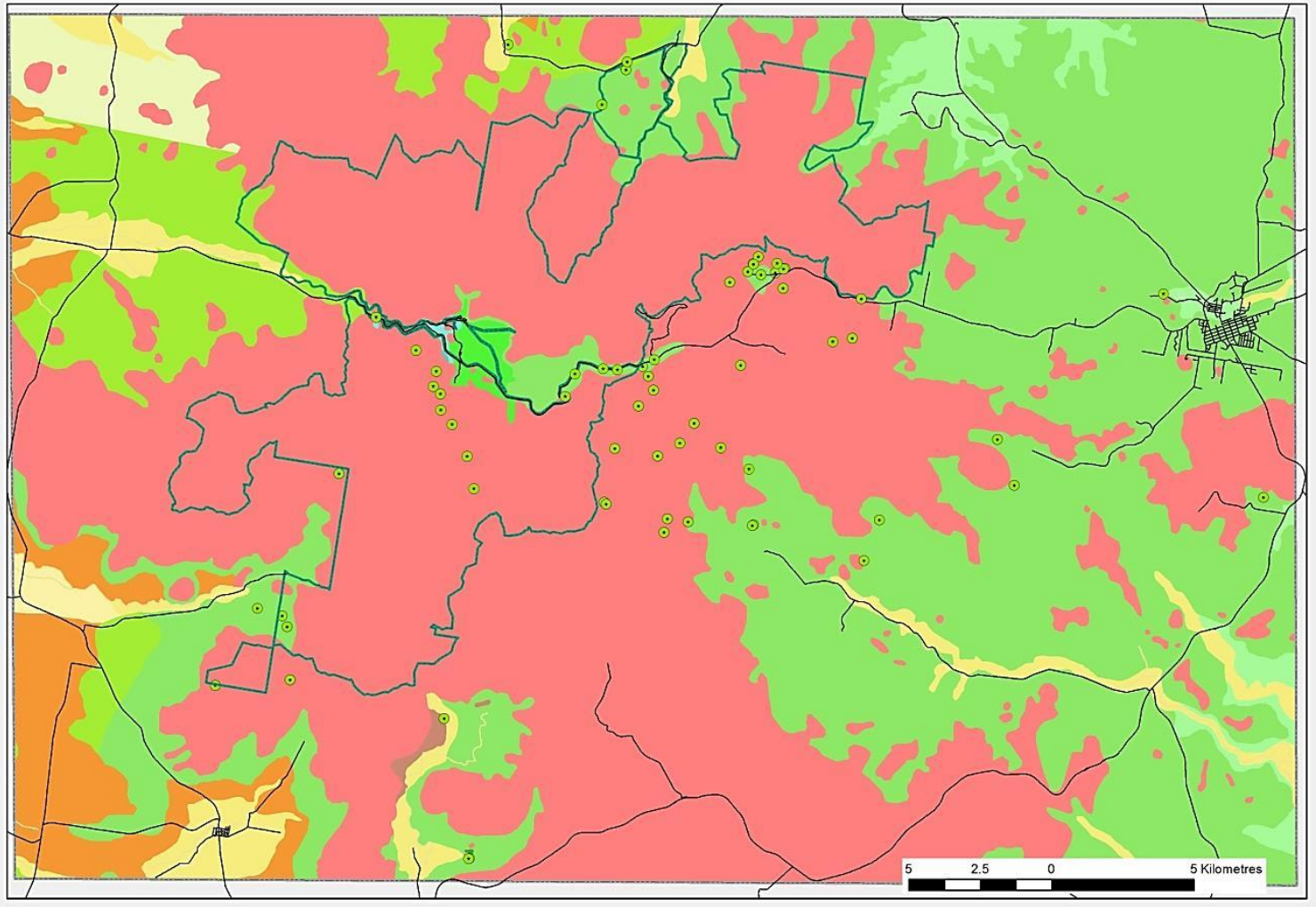

Existing mapping

- Volcanic and non-volcanic rocks

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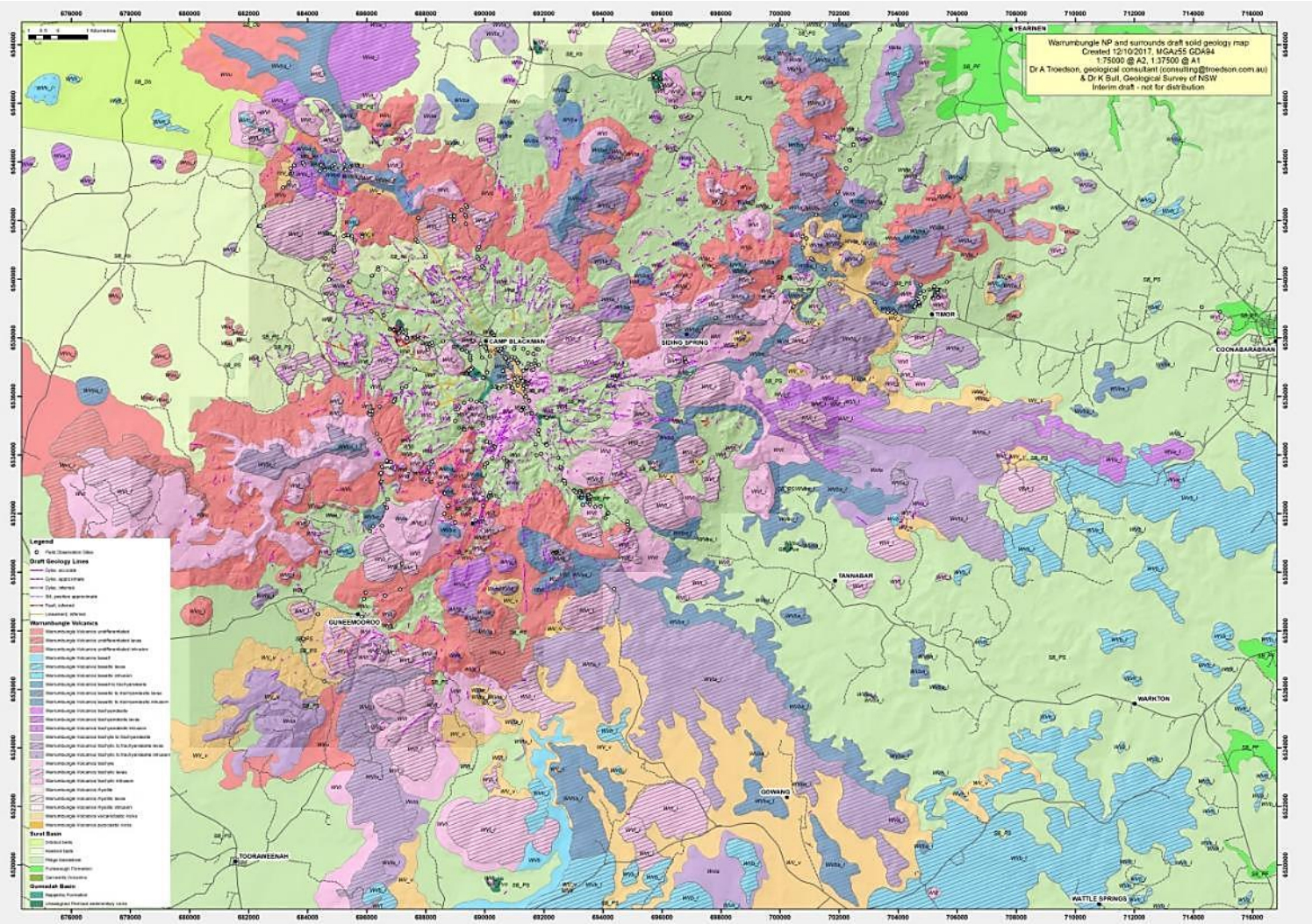

New mapping

- Drs Alexa Troedson and Kate Bull
- Many thesis maps
- Field work
- LiDAR used to map lava flows
- New geophysics very useful to delineate age of flows, country rock, and intrusive plugs

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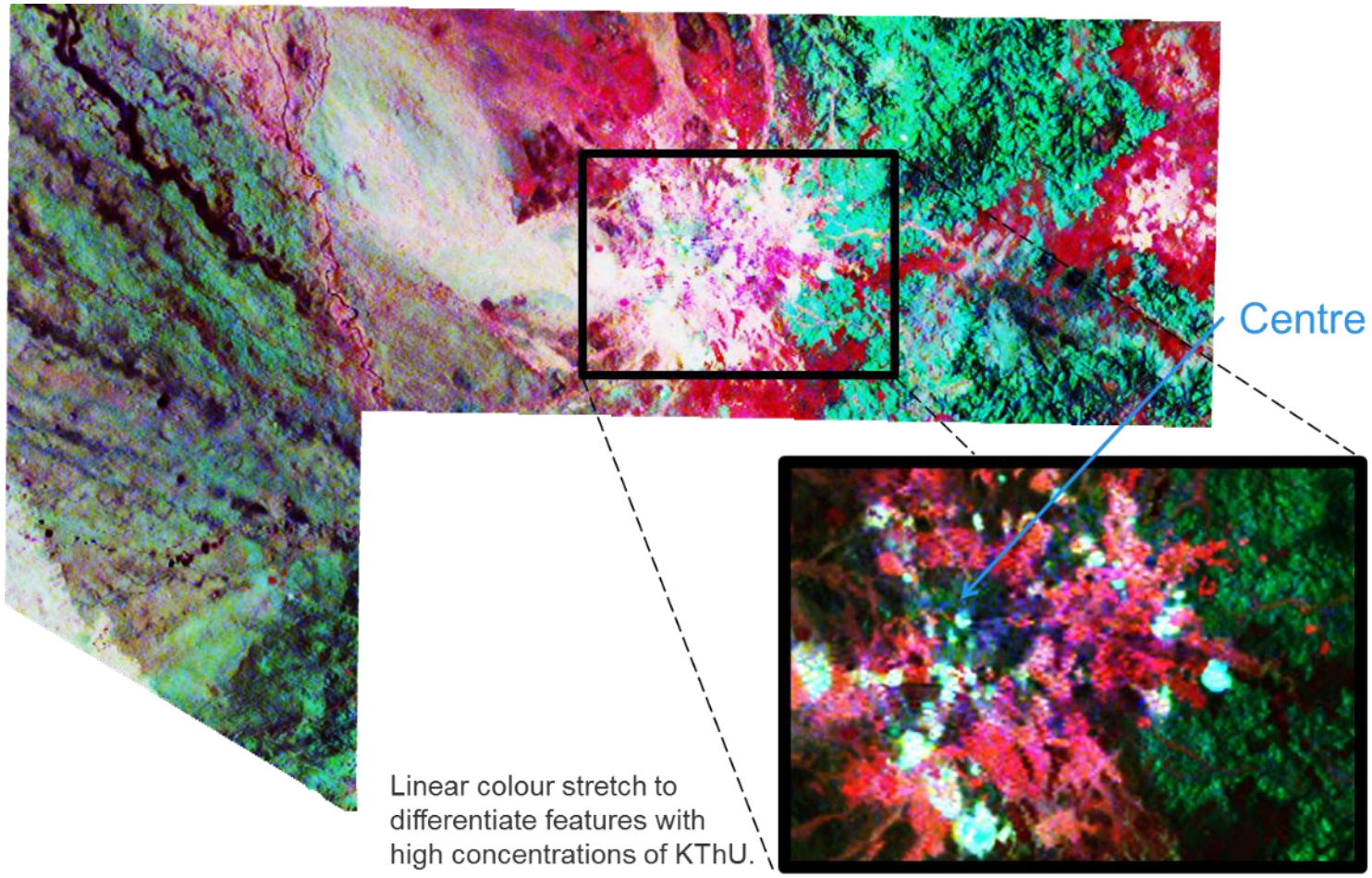
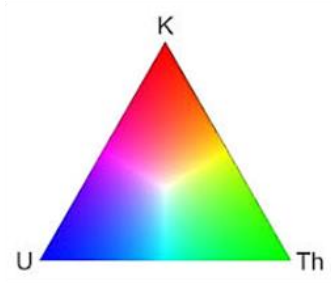
KThU detail



Equalised histogram colour stretch to enhance features with lower concentrations of KThU.



Black = low in all three
White = high in all three

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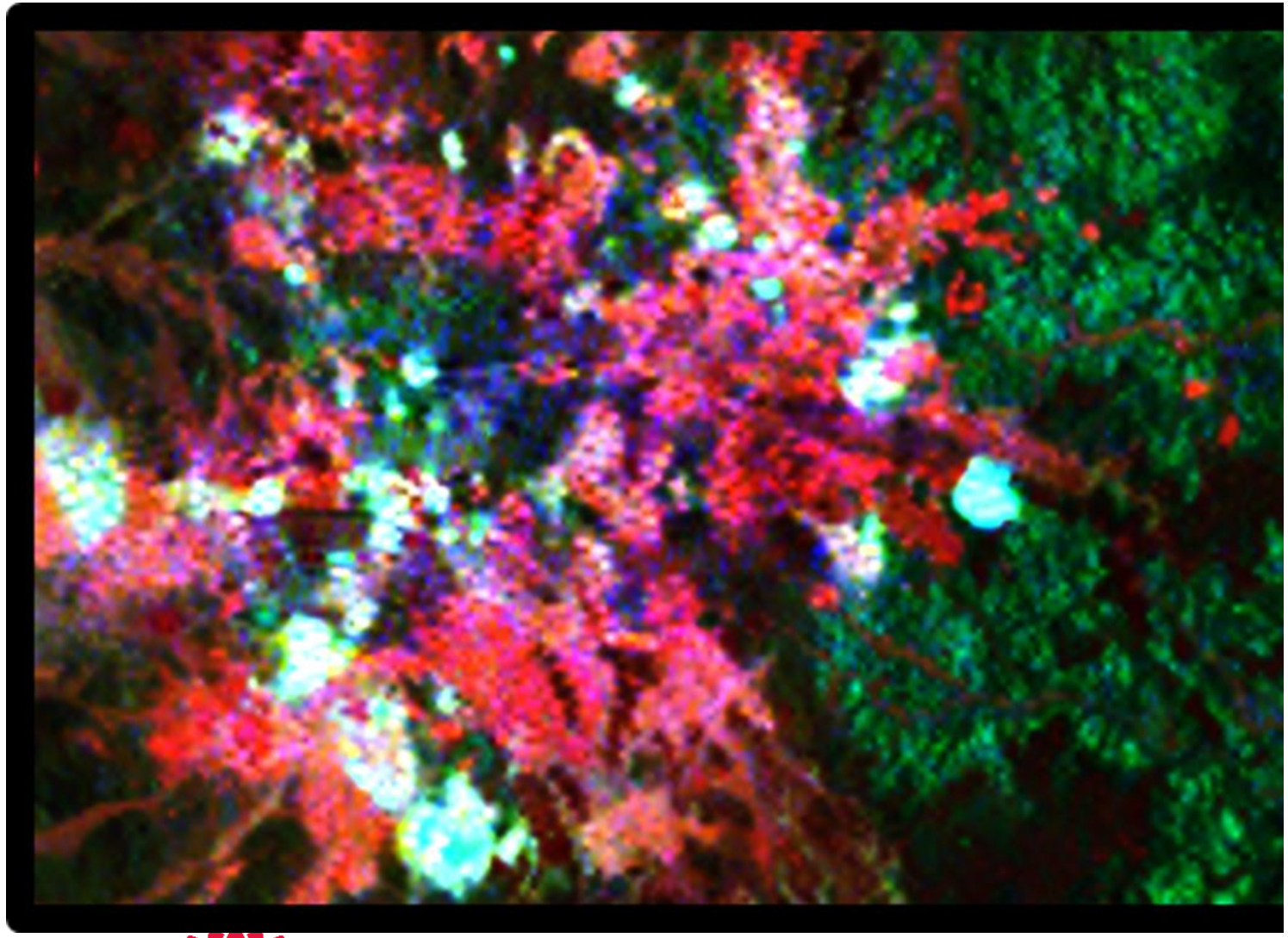

Linear colour stretch

Value of radiometrics

- Pilliga Sandstone is dark green
- Trachyte is white
- Some basaltic units as dark red
- Many previously mapped 'trachytes', are altered basalts

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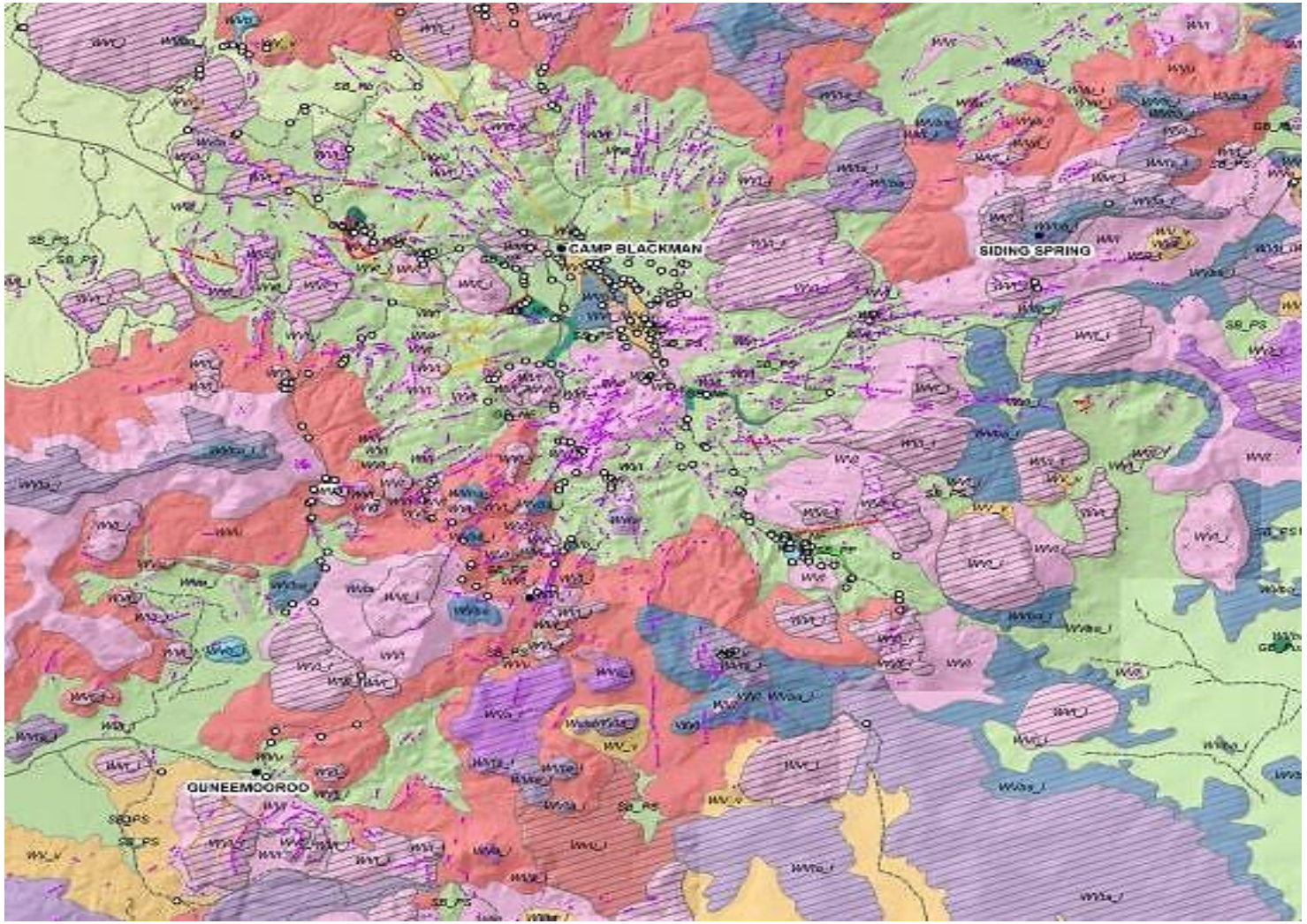

Age and source of volcano

- $^{40}Ar/^{39}Ar$ geochronology indicates that volcanic activity lasted for ~3 Ma in stages:
  - 18 – 17.5 Ma
  - ~17 – 16.5 Ma
  - 16.5 – 15.5 Ma
- The volcano was fed by a plumbing system which became progressively more complex with time. Magmas stagnated and fractionated in multiple mush zones at various depths, periodically replenished by more primitive magmas. Magma recharge appears to have triggered eruptions incrementally over a period of 3 Ma.
- Crustal mush zones were at ~41 km and 19-7 km, based on cpx barometry.

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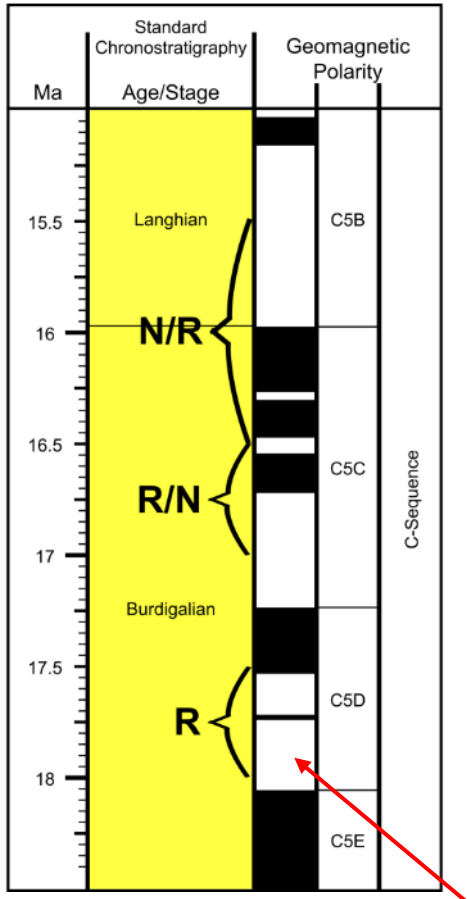

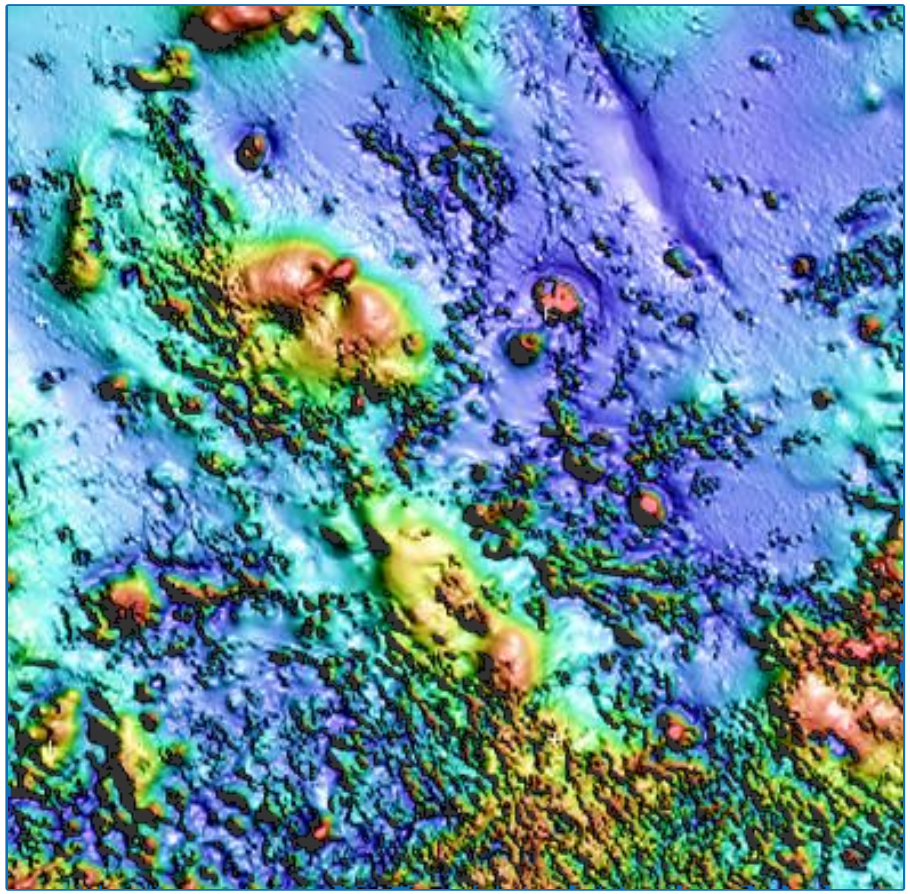

Black = normal, white = reversed

Normal and reversed magnetic anomalies

- Age range of volcanic activity spanned a series of magnetic field polarity reversals
- Resulted in normal and reversed anomalies present in the data

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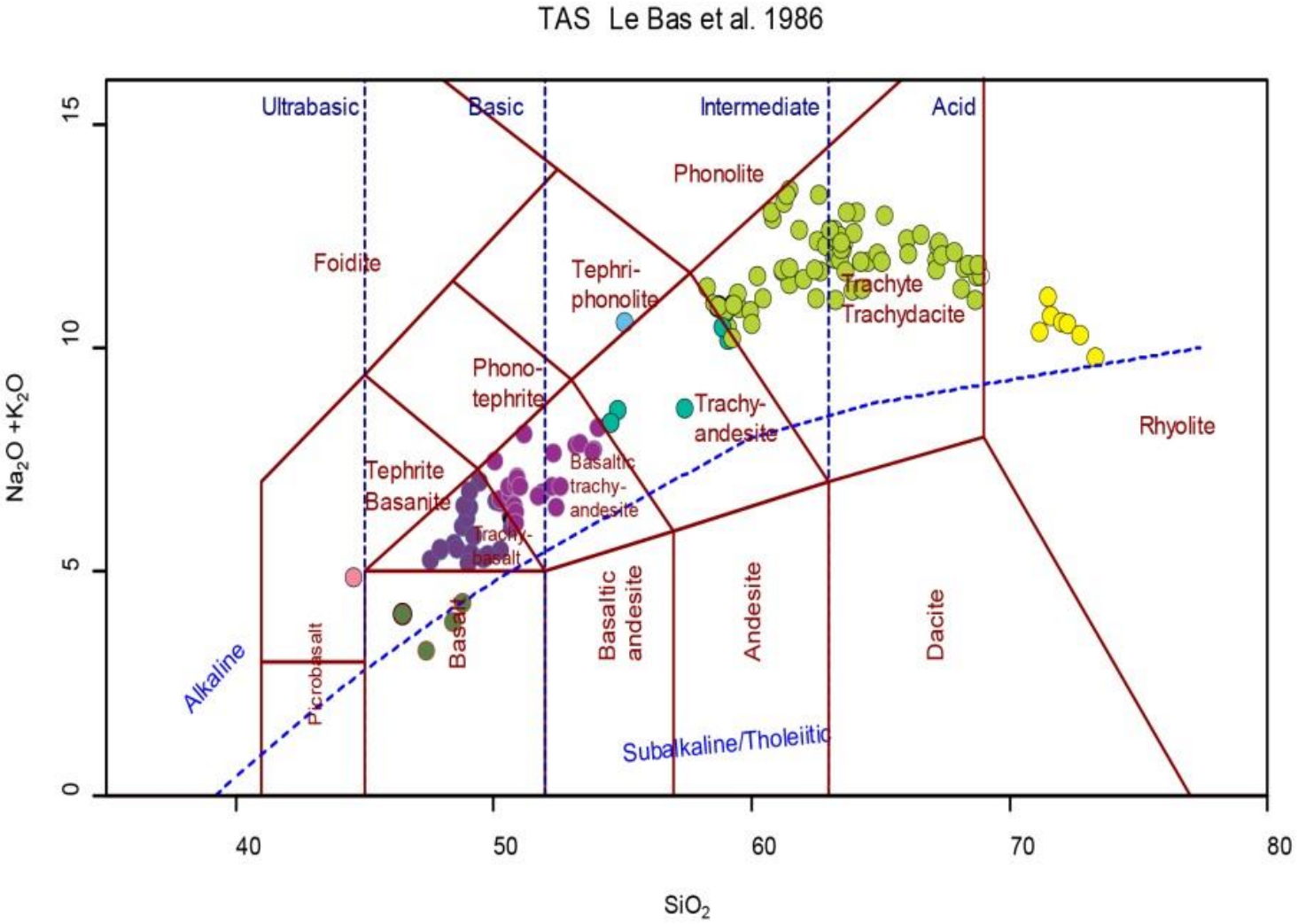
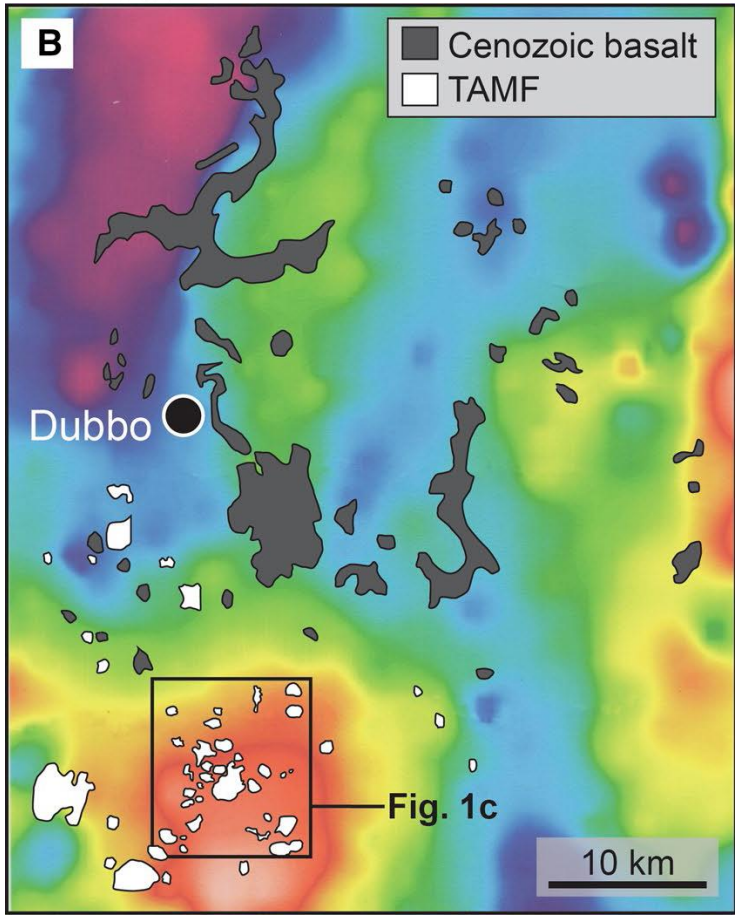


Geochemistry

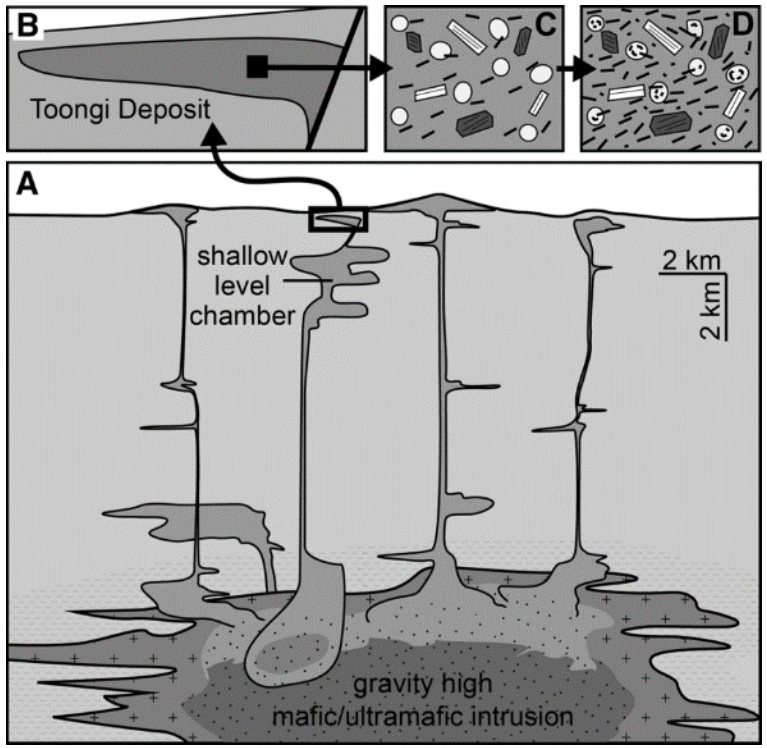
- Despite the complexity of the magmatic history, the geochemistry shows a simple fractionation series from a single depleted mantle source

Geochem data from Ghorbani *pers. comm.*

Warrumbungle Volcanics analogue: Toongi



Spandler and Morris, 2016



- Jurassic (~180 Ma)
- Peralkaline Zr, Hf, Nb, Ta, Y & REE
- Similar intracontinental rift setting, geochemistry and magmatic history

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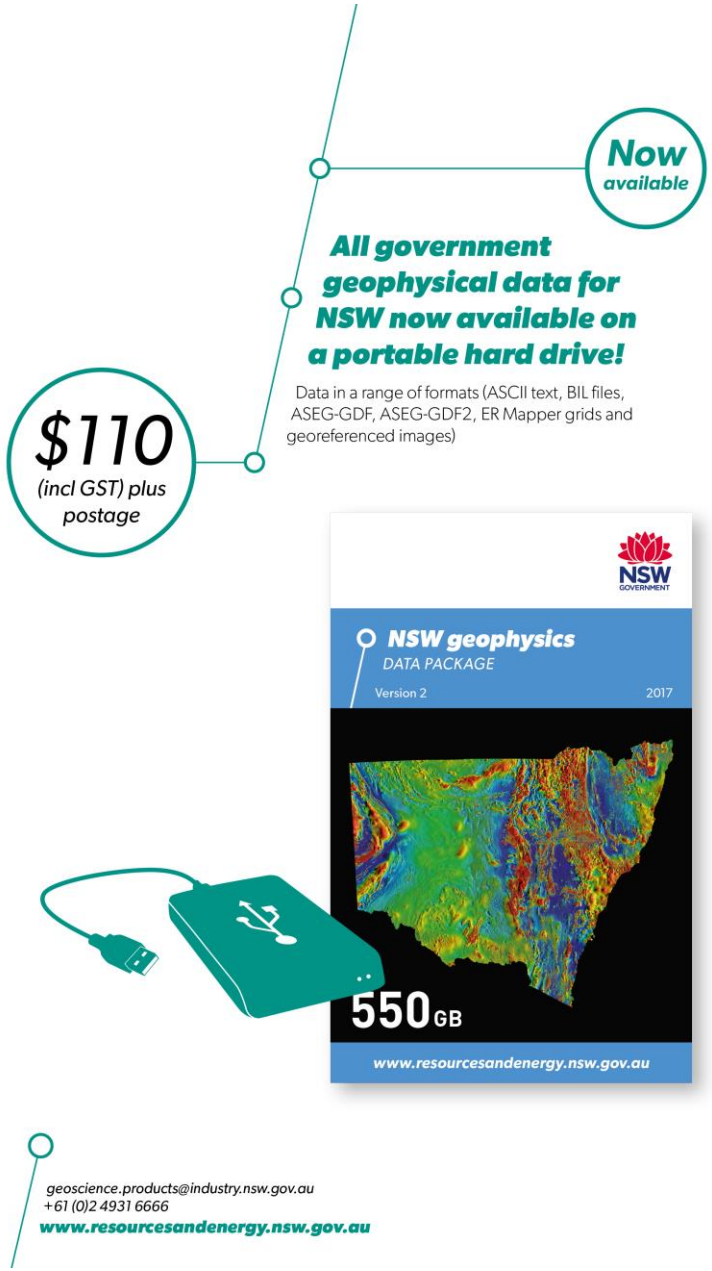

Where do you get it?

- Hard-drive $110
- GA's website:

https://www.resourcesandenergy.nsw.gov.au/miners-and-explorers/geoscience-information/products-and-data/geophysical-images-and-data

- Our website:

http://www.geoscience.gov.au/cgi-bin/mapserv?map=/nas/web/ops/prod/apps/mapserver/gadds/

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