

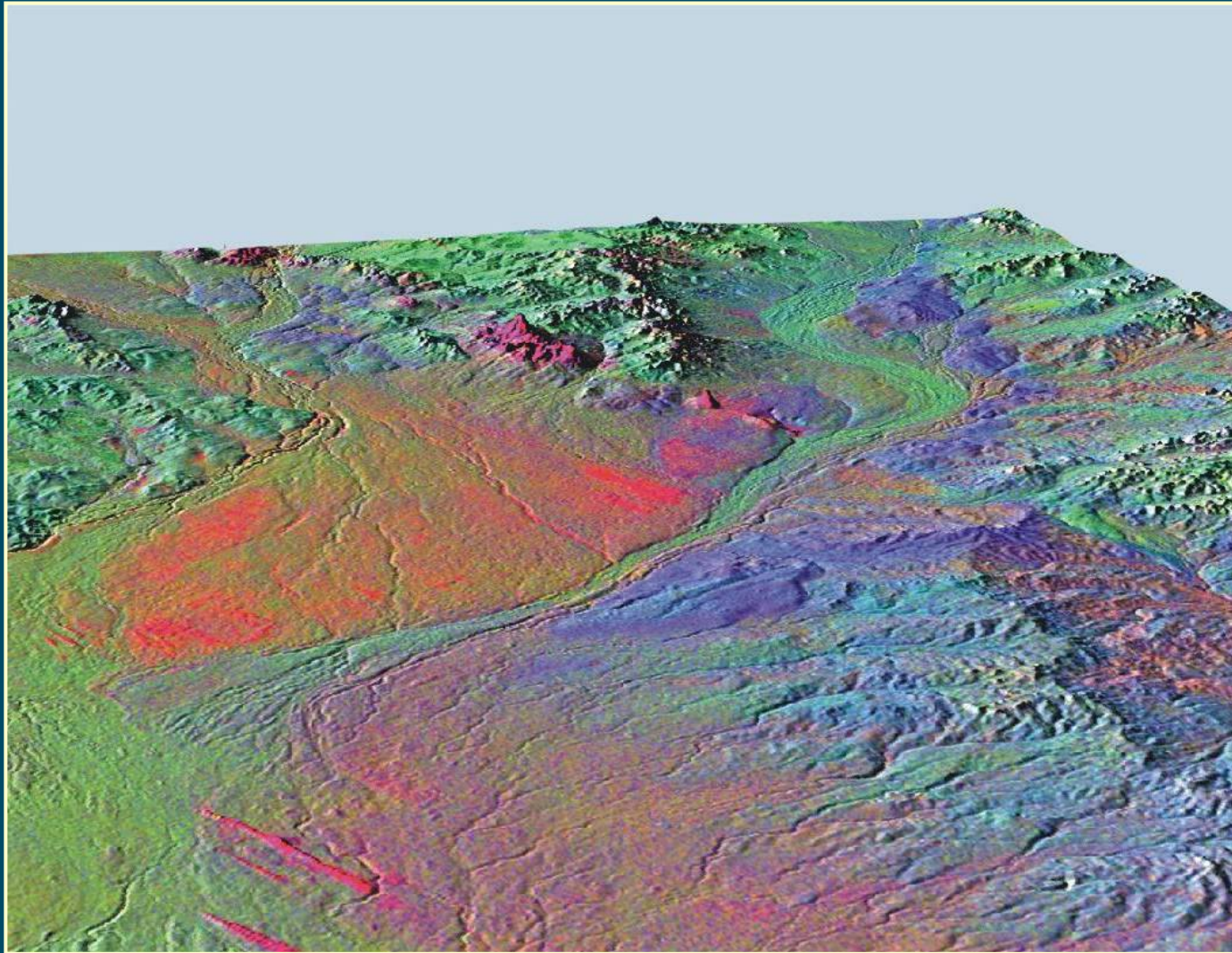


Australian Government
Geoscience Australia

The Radiometric Map of Australia

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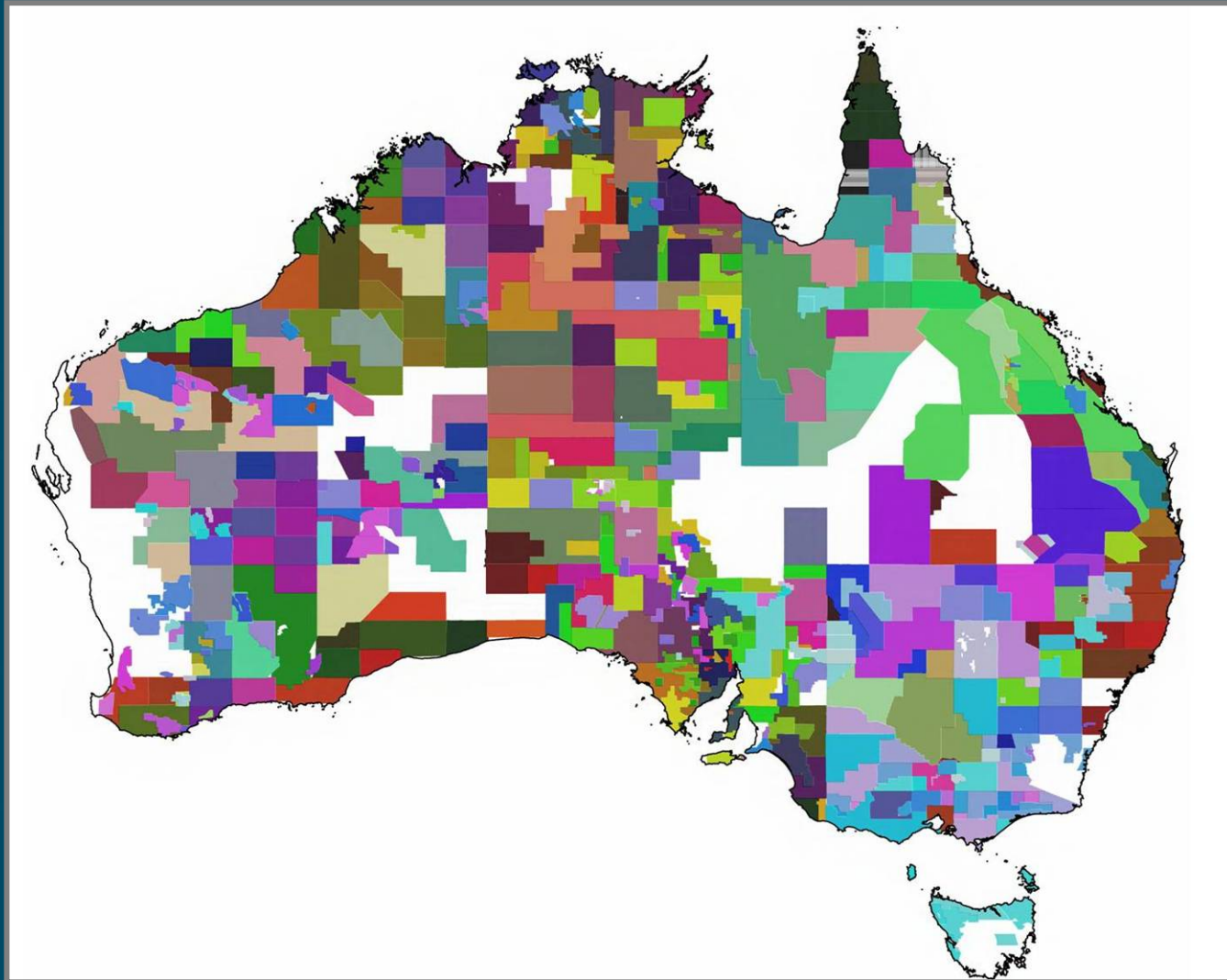
Ternary (K-red, U-blue, Th-green)



Talk overview

- The problem – an un-levelled database
- Gamma-ray refresher – sources of error
- Grid levelling issues
- AWAGS – a new radioelement baseline
- Levelling to the new baseline
- The Radiometric Map of Australia

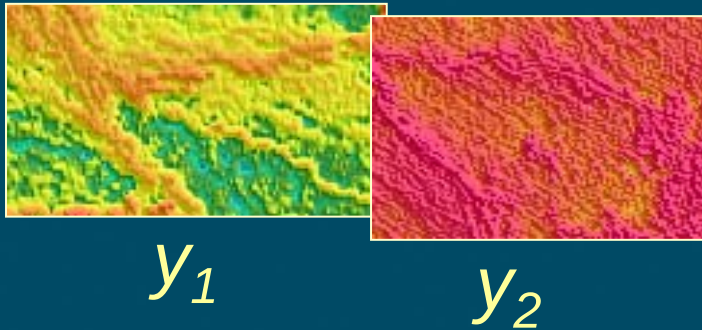
The problem ...



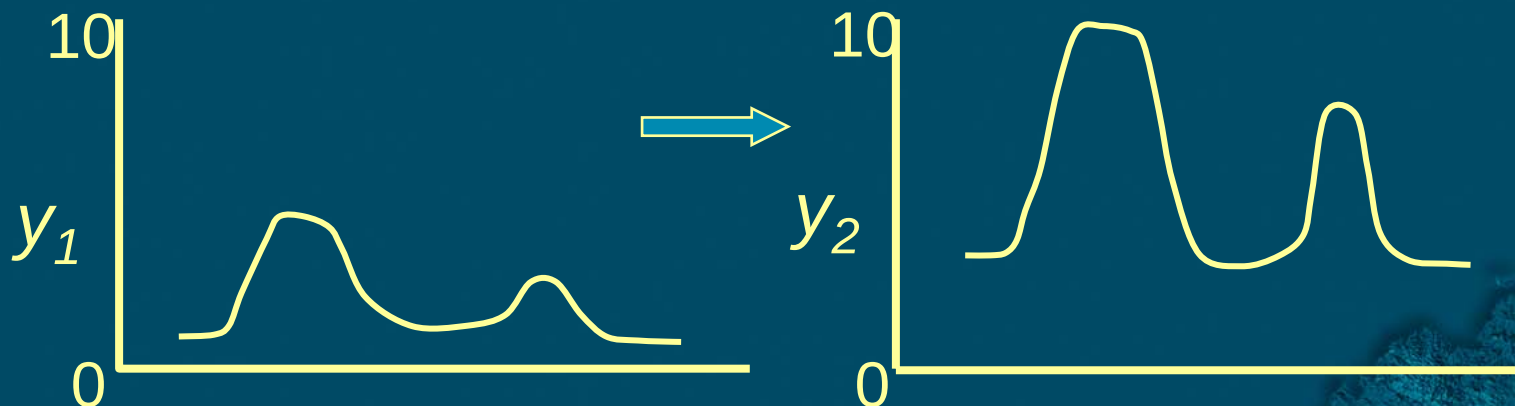
Factors affecting counts/concentrations

- Survey / equipment parameters
 - detector volume
 - detector efficiency
 - window size
 - flying height
- Processing errors
 - inadequate procedures
 - poor calibration
- Environmental effects
 - vegetation
 - soil moisture

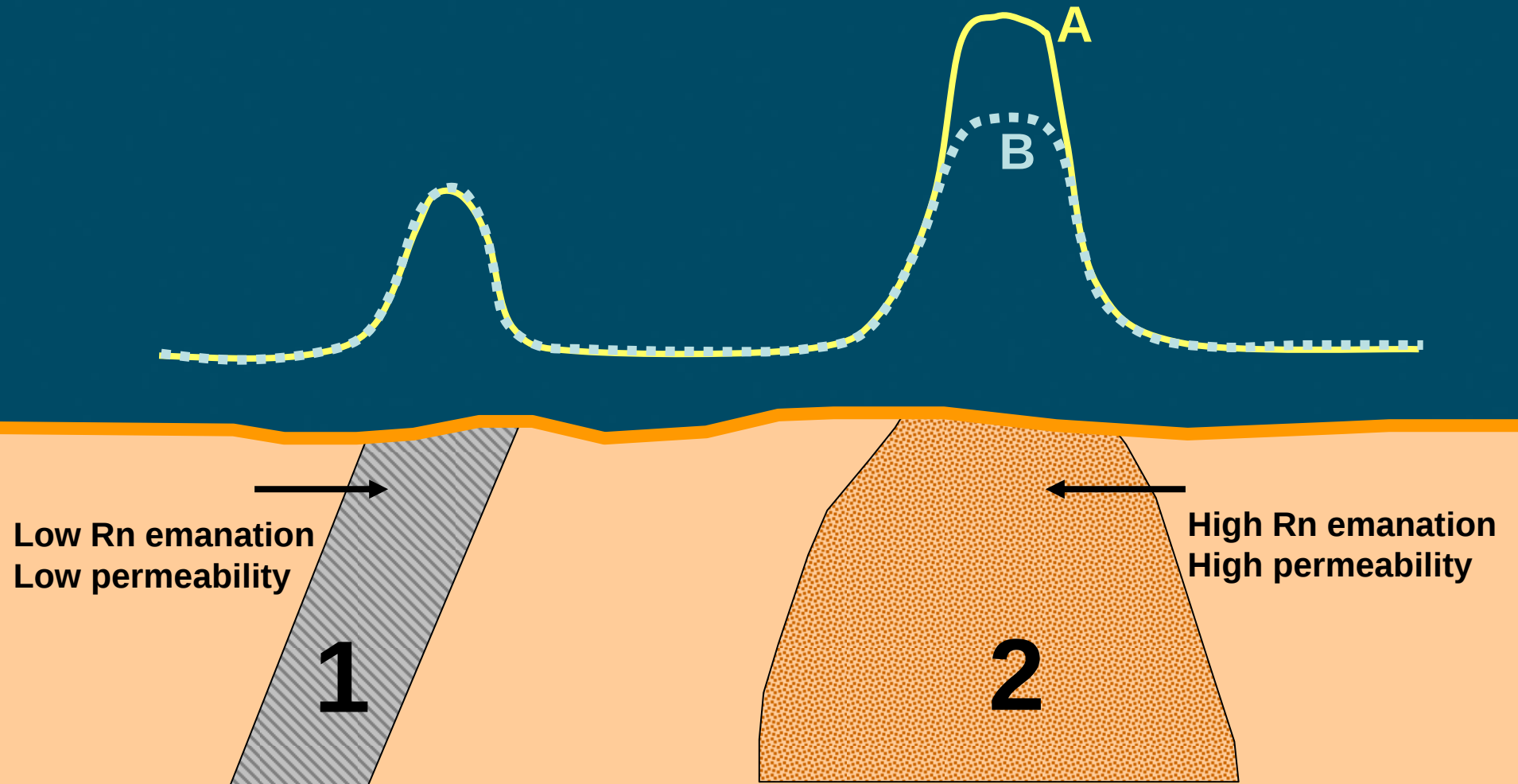
Grid levelling adjustment model



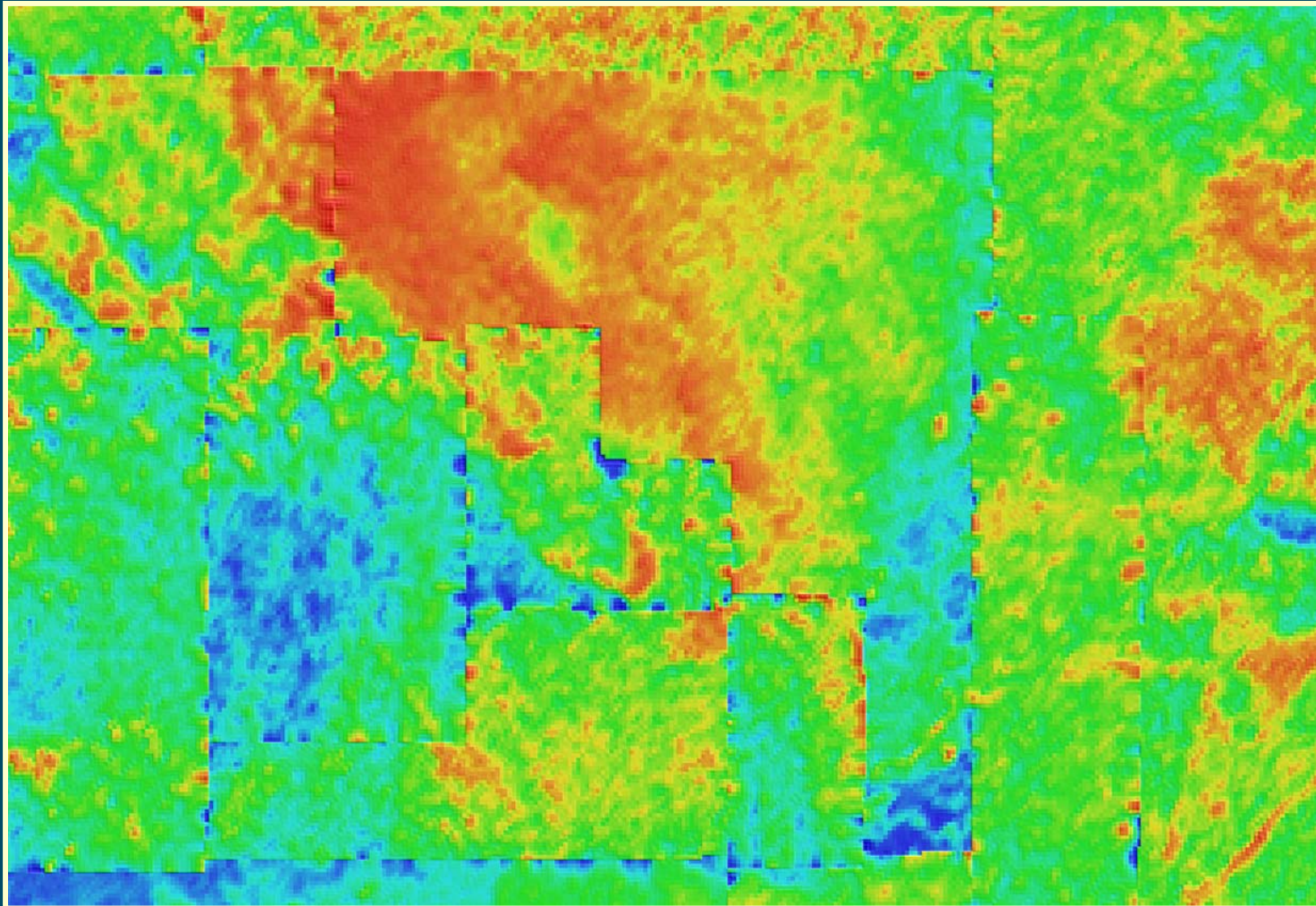
$$y_2 = G_{y_1}^{y_2} y_1 + S_{y_1}^{y_2}$$



Problem 1. Radon exhalation

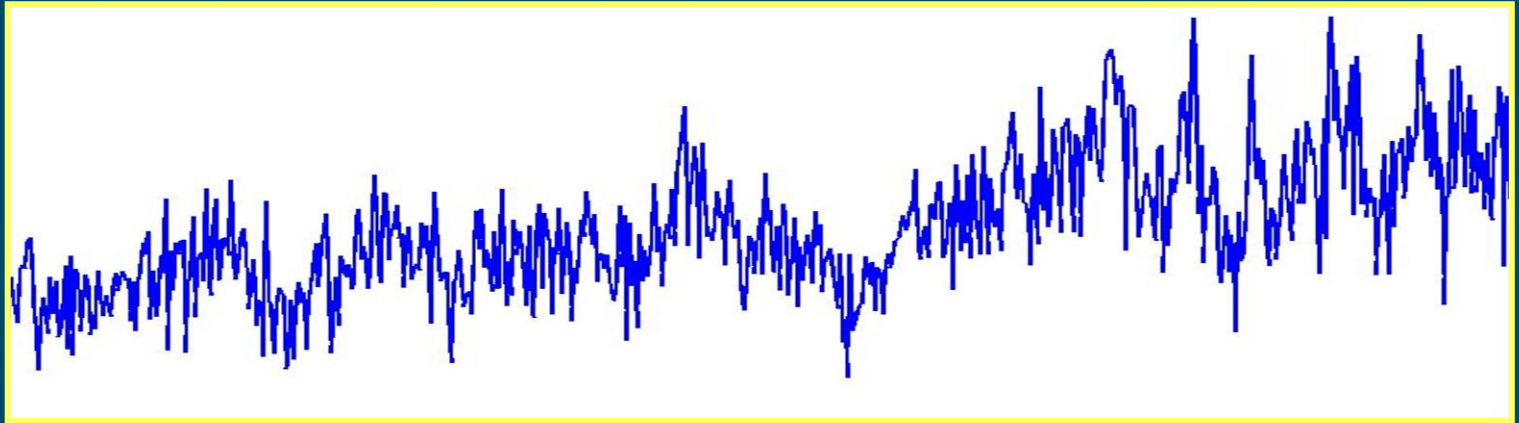


Problem 2. Tilted grids

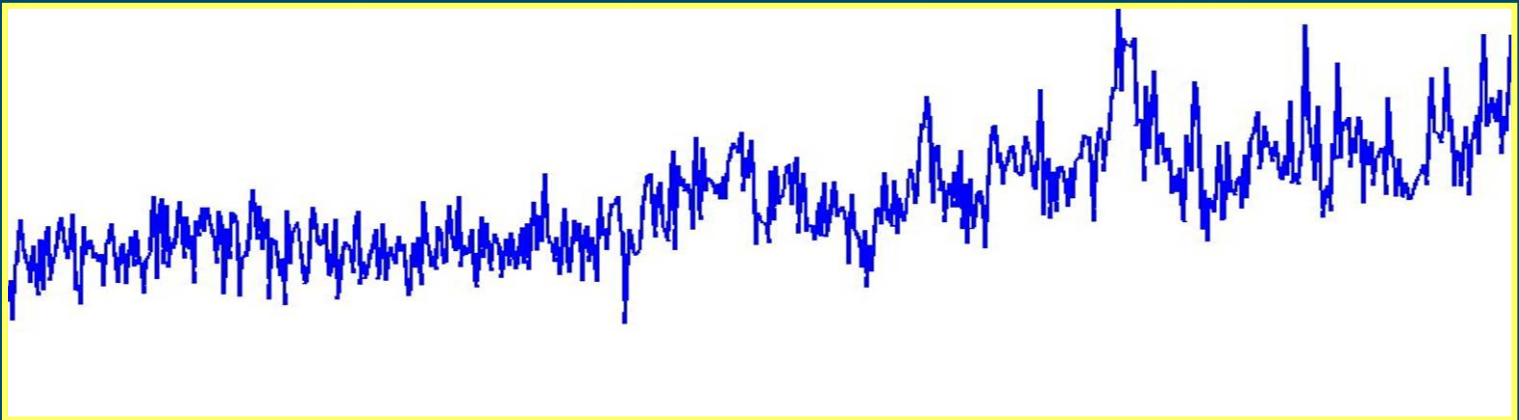


Problem 3. Poor S/N ratio

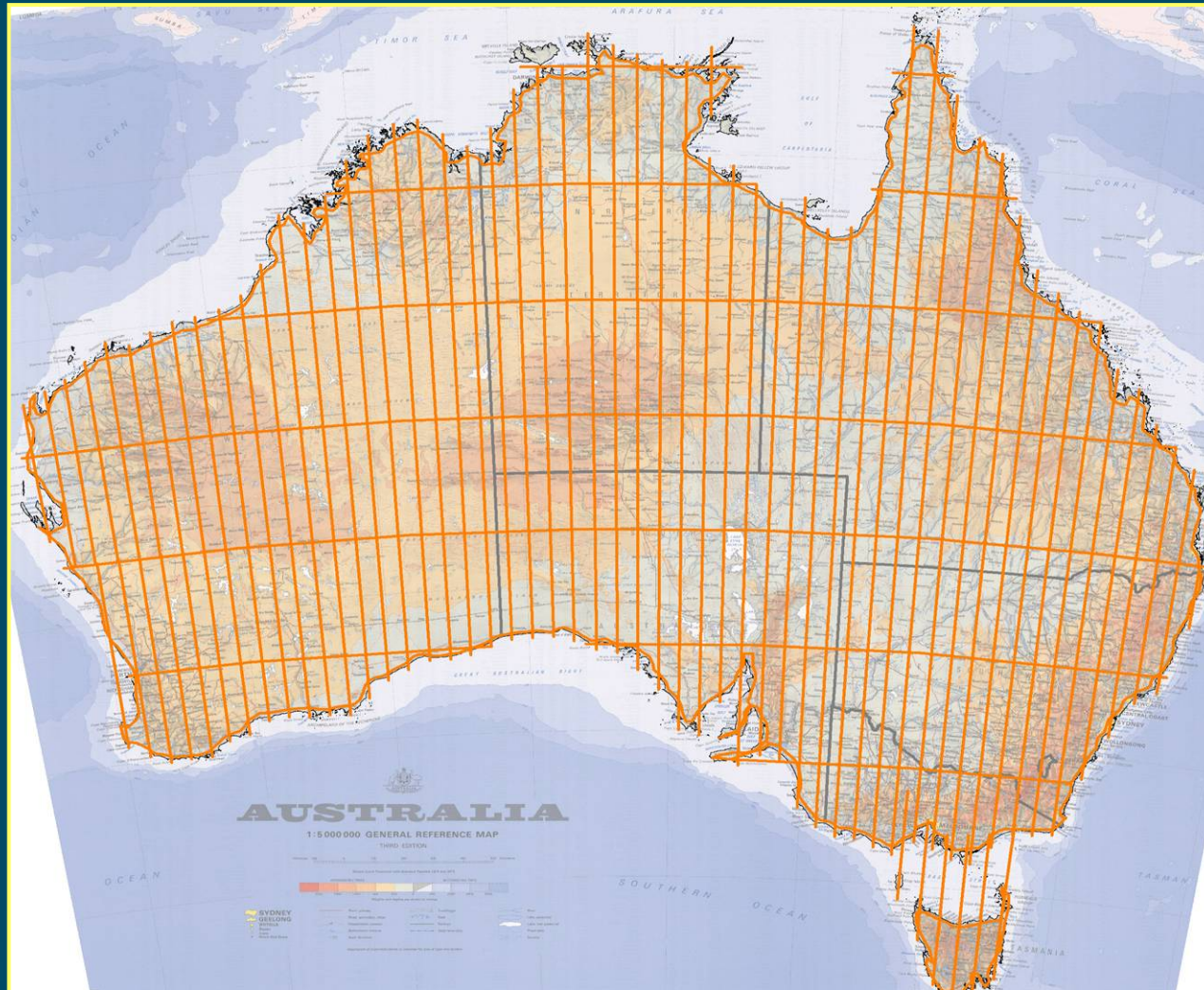
U_1



U_2



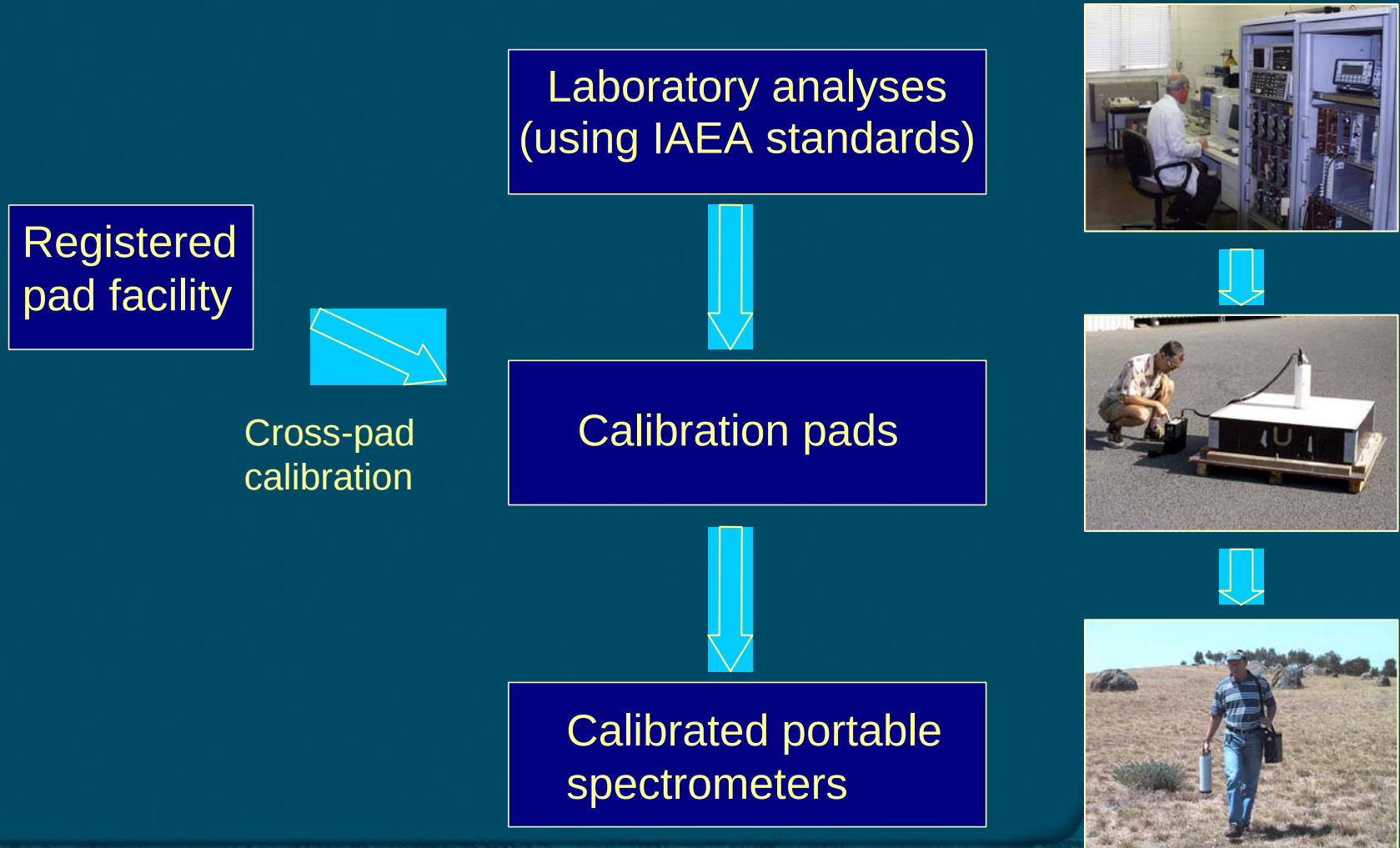
The solution: AWAGS flight lines



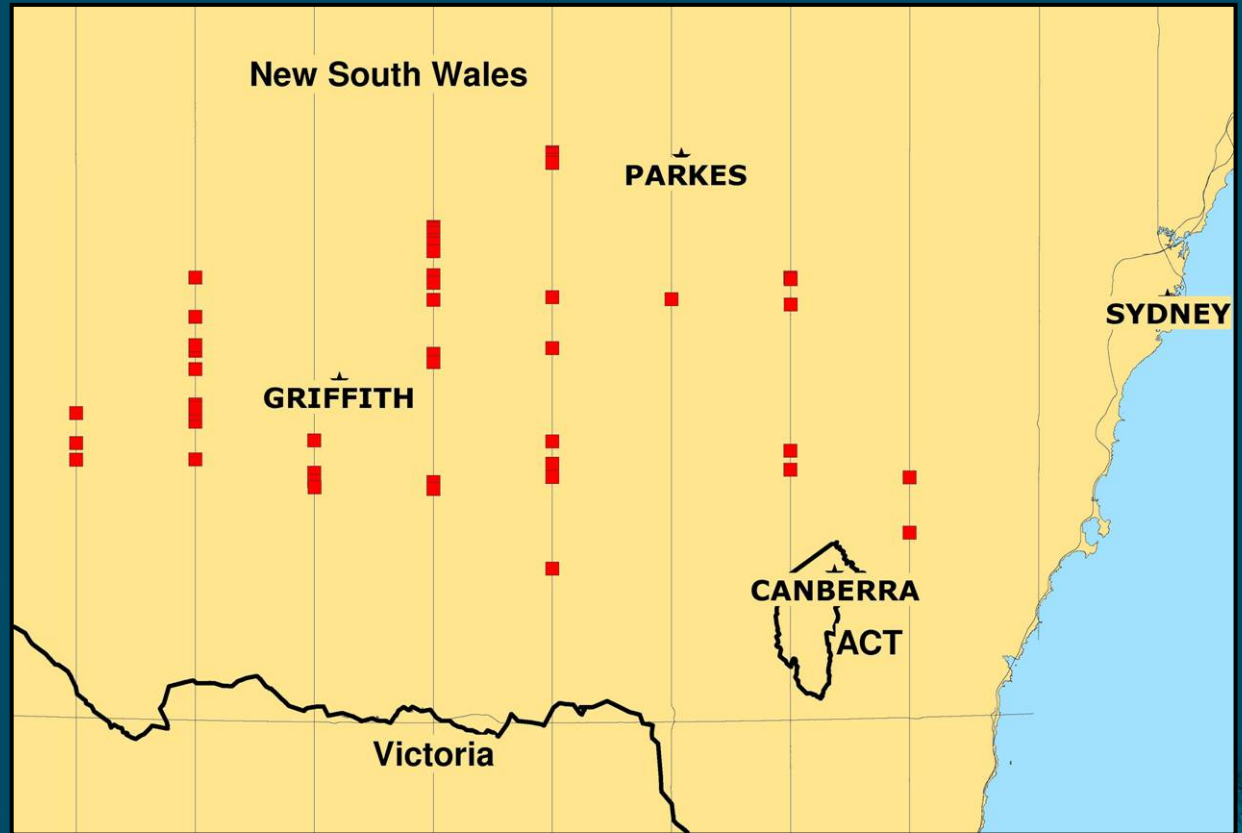
Spectrometer calibration



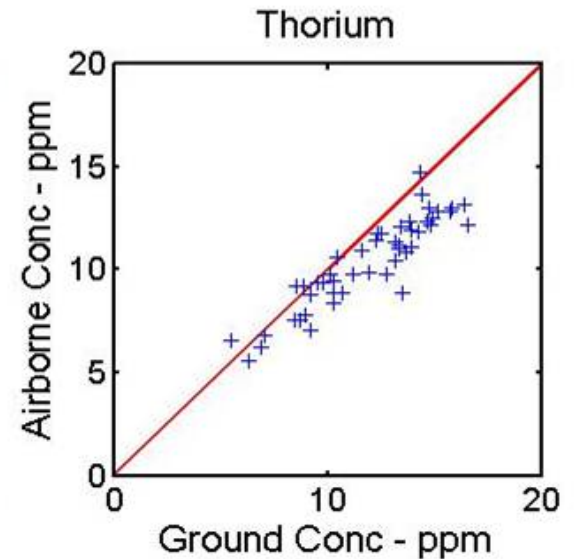
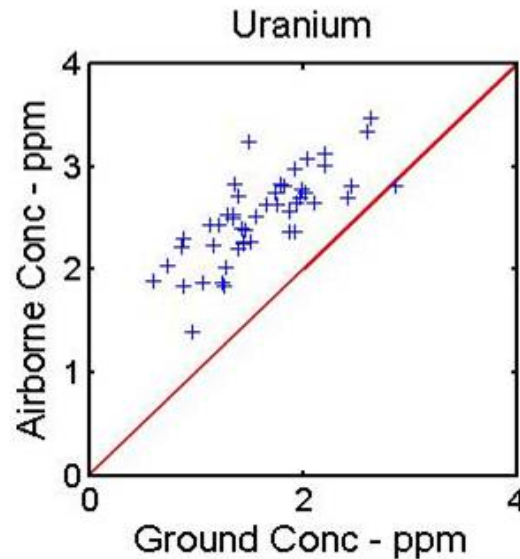
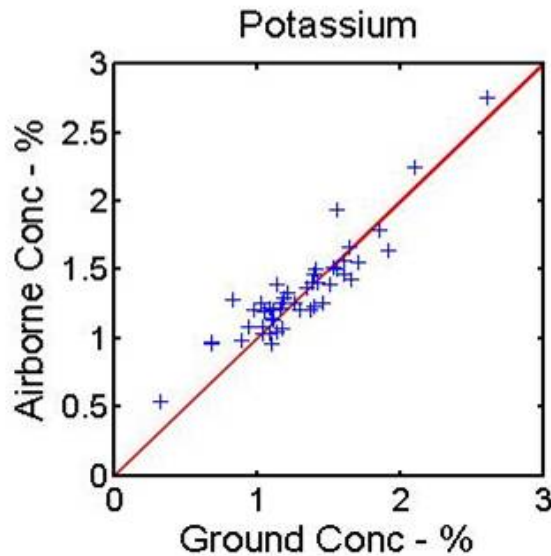
Registering to the global baseline



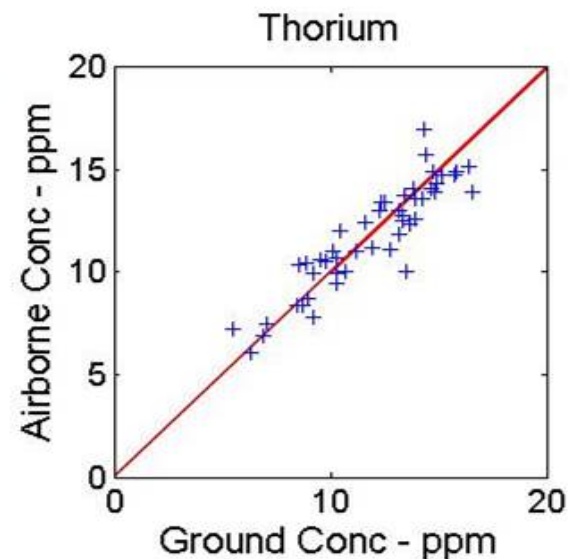
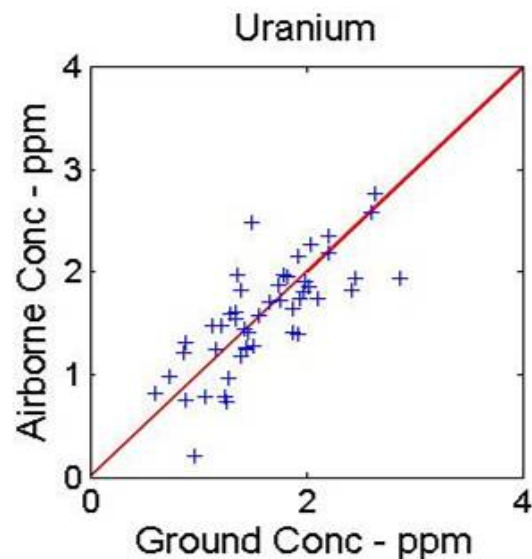
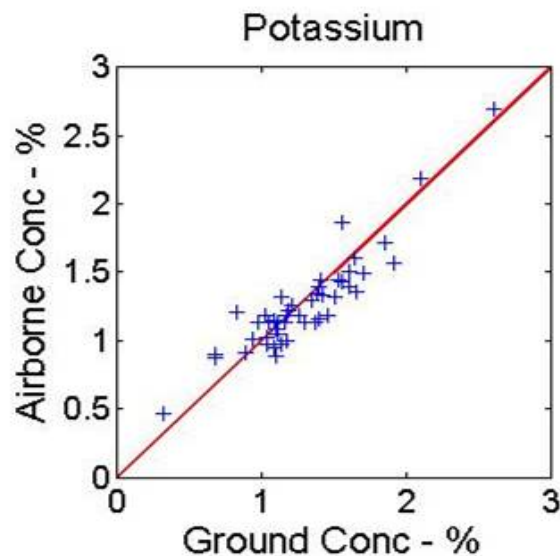
AWAGS back-calibration sites



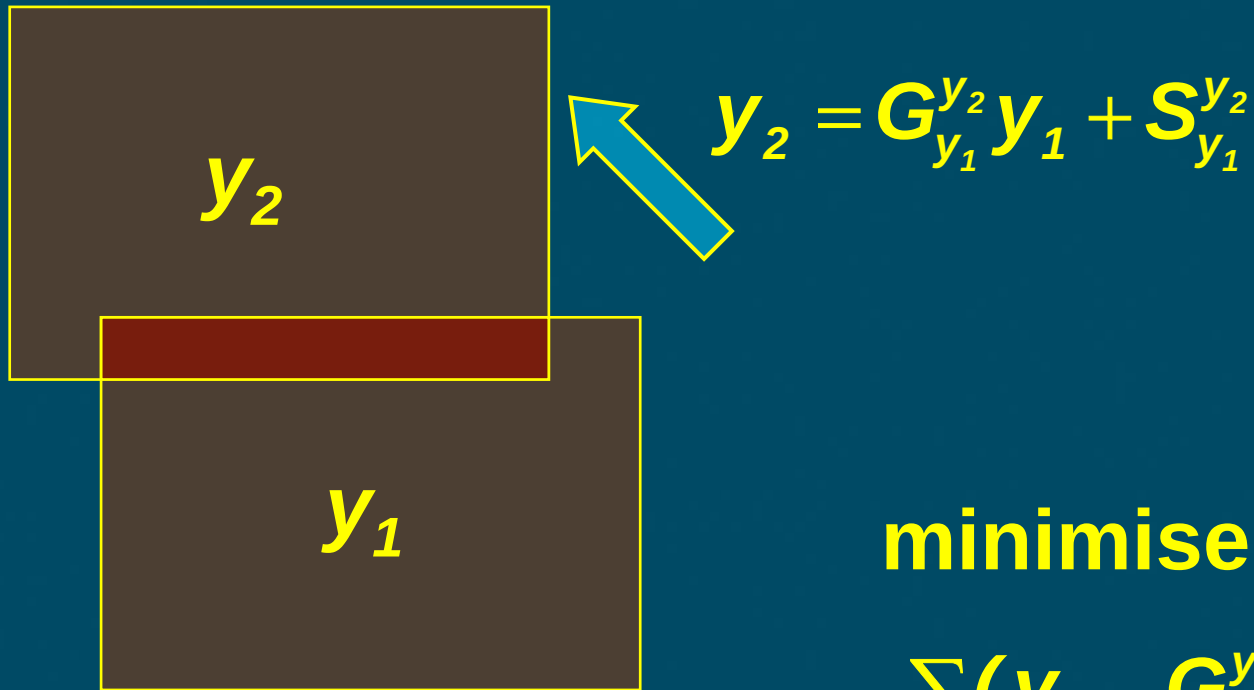
Back-calibration – before adjustment



Back-calibration – after adjustment



Step 1 – estimate the best shift and scale for each overlapping pair

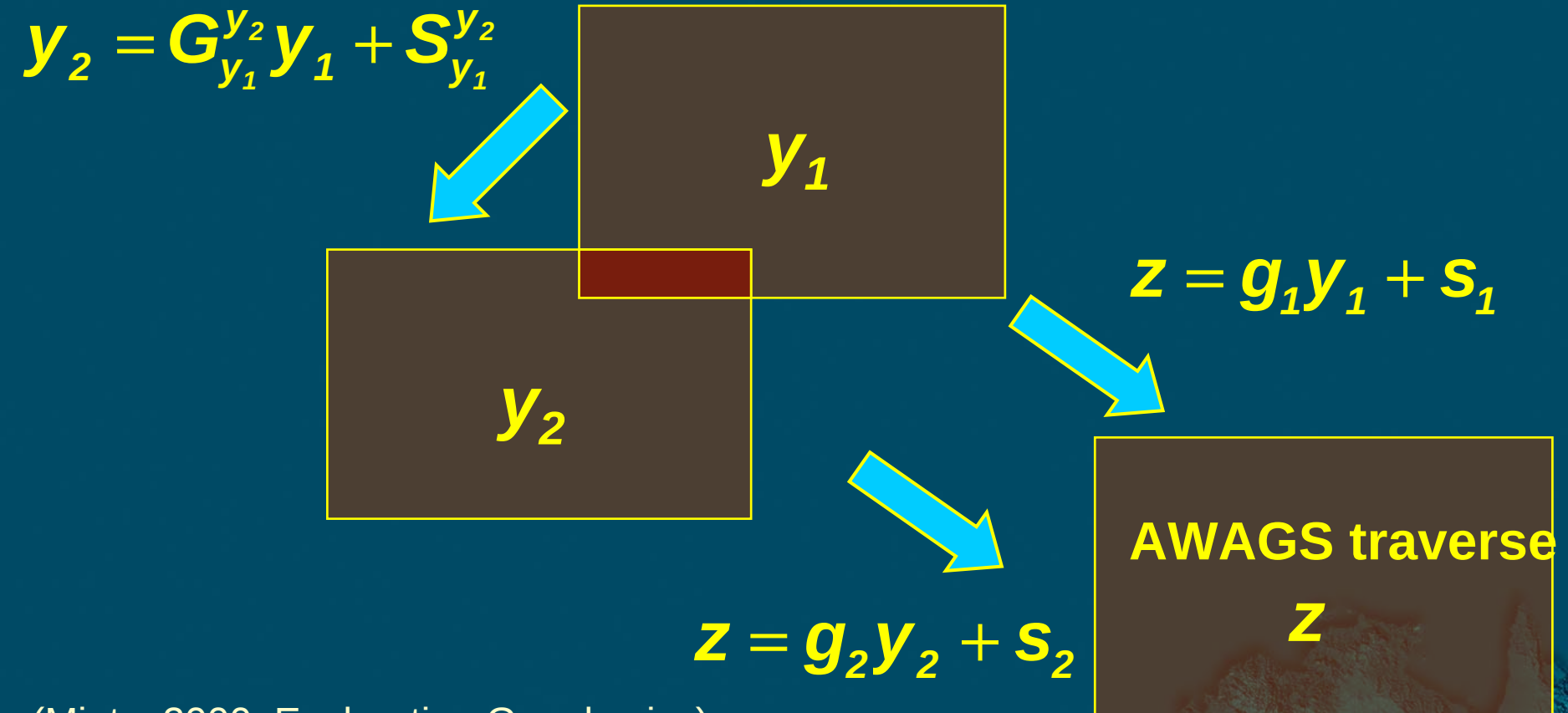


minimise:

$$\Sigma (y_2 - G_{y_1}^{y_2} y_1 - S_{y_1}^{y_2})^2$$

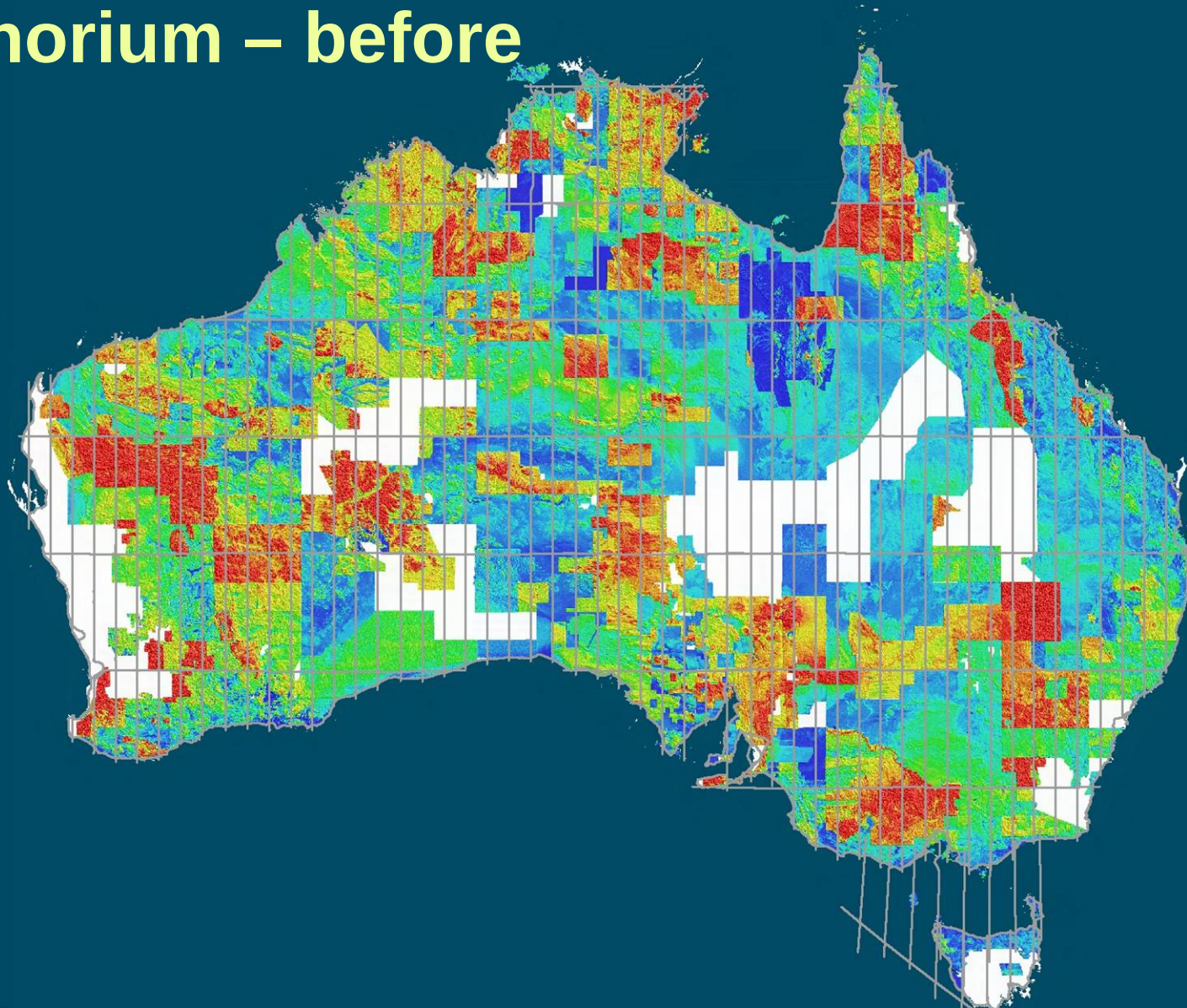
(Minty, 2000. Exploration Geophysics)

Step 2 – level to AWAGS traverses

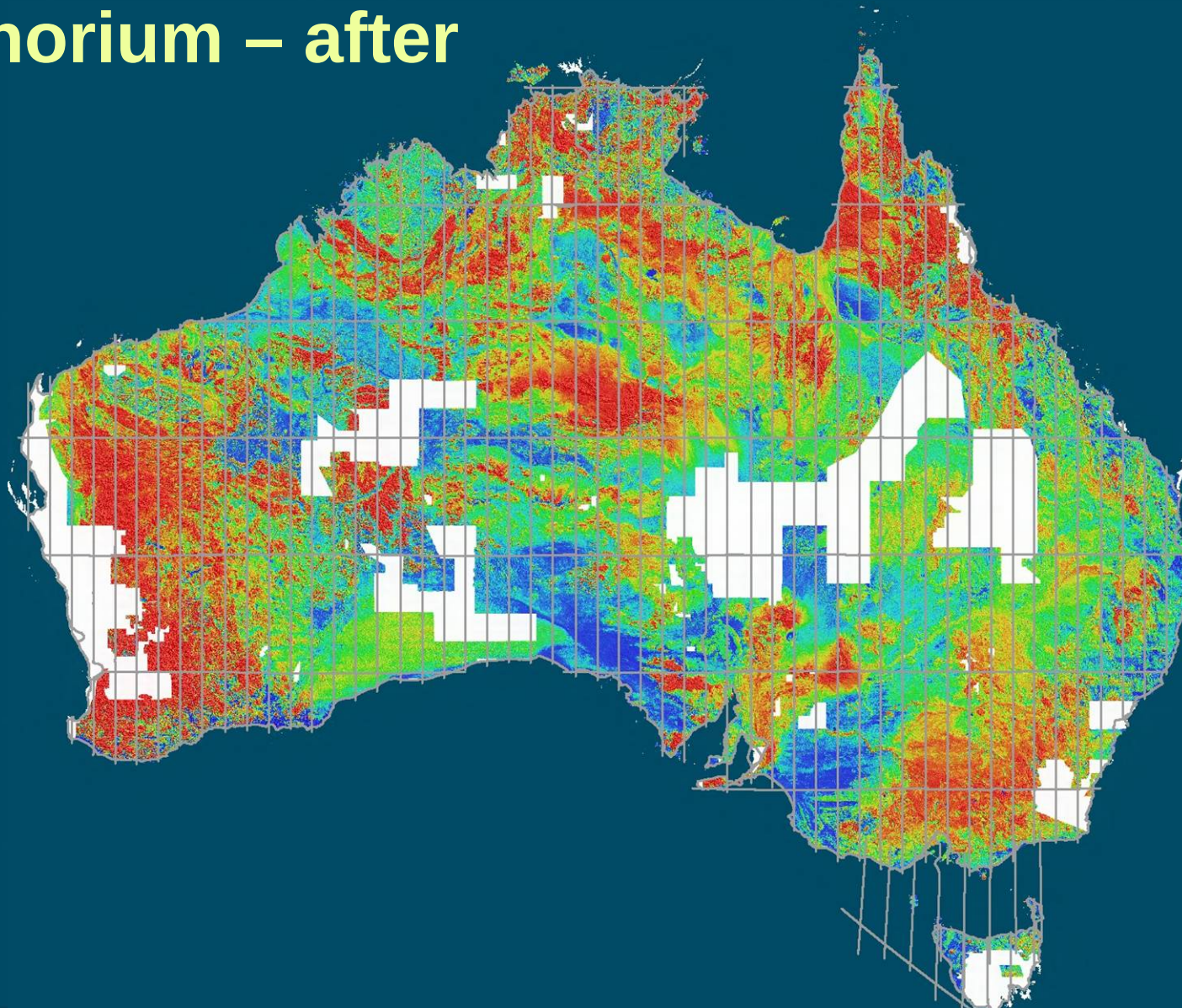


(Minty, 2000. Exploration Geophysics)

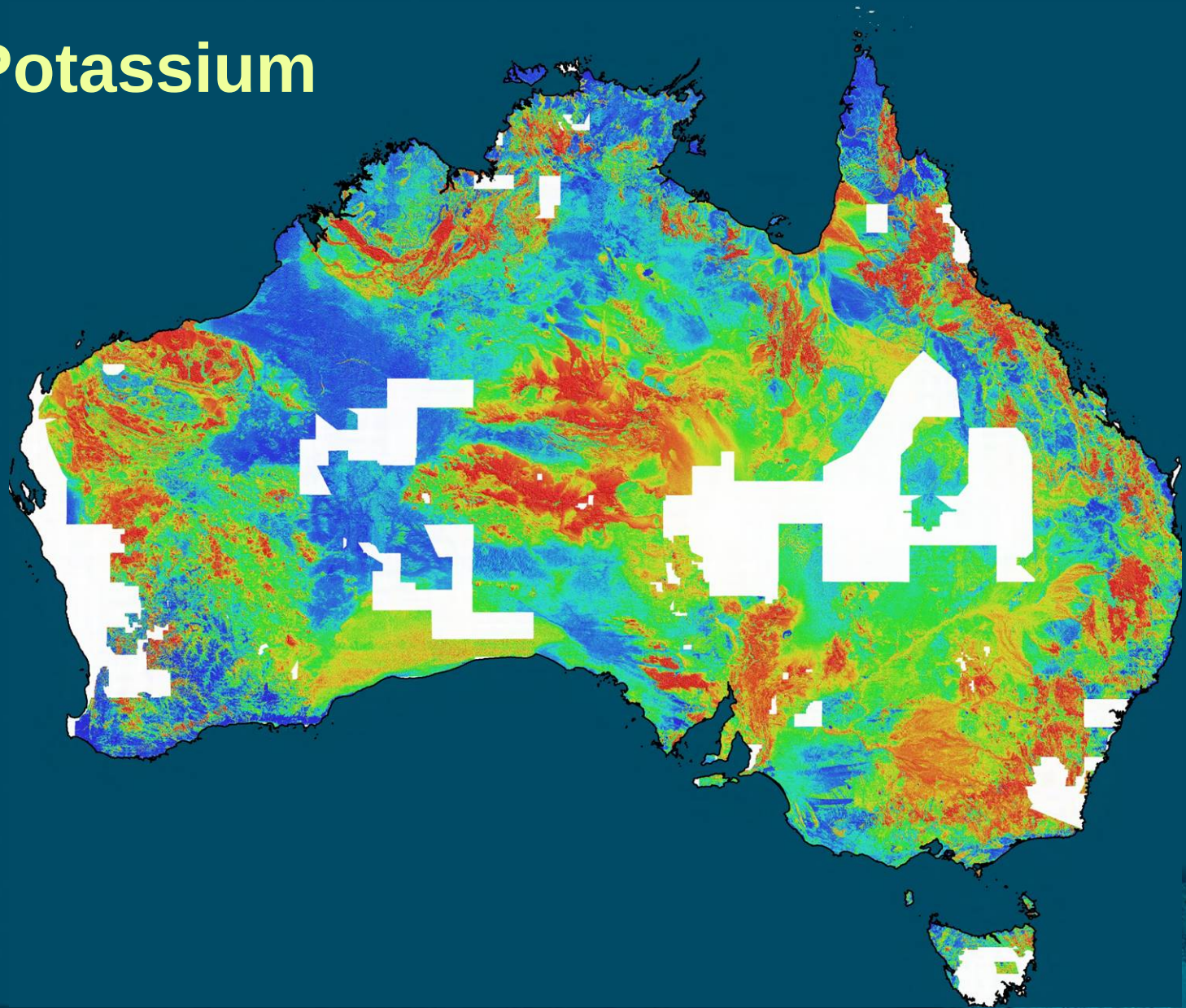
Thorium – before



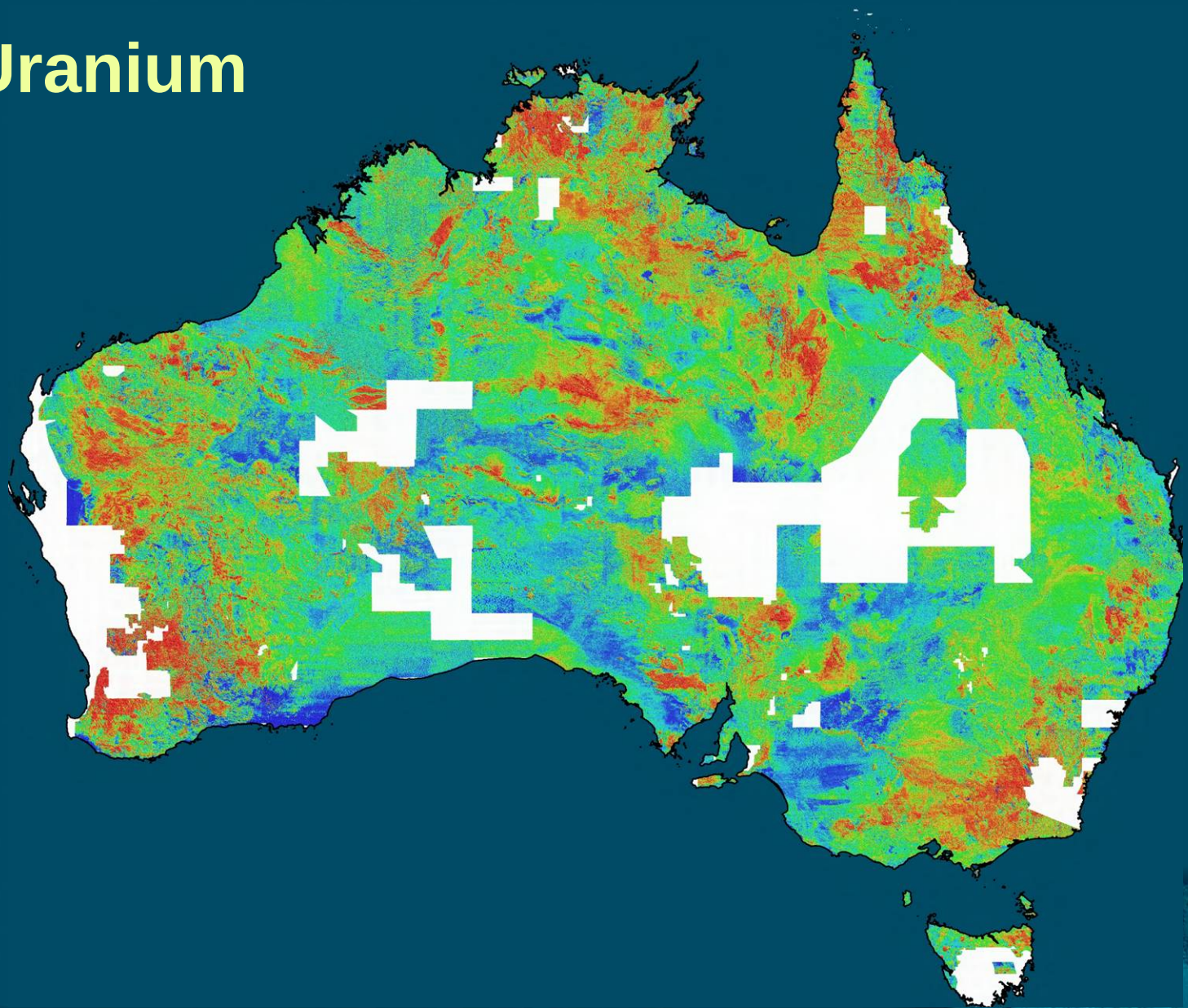
Thorium – after



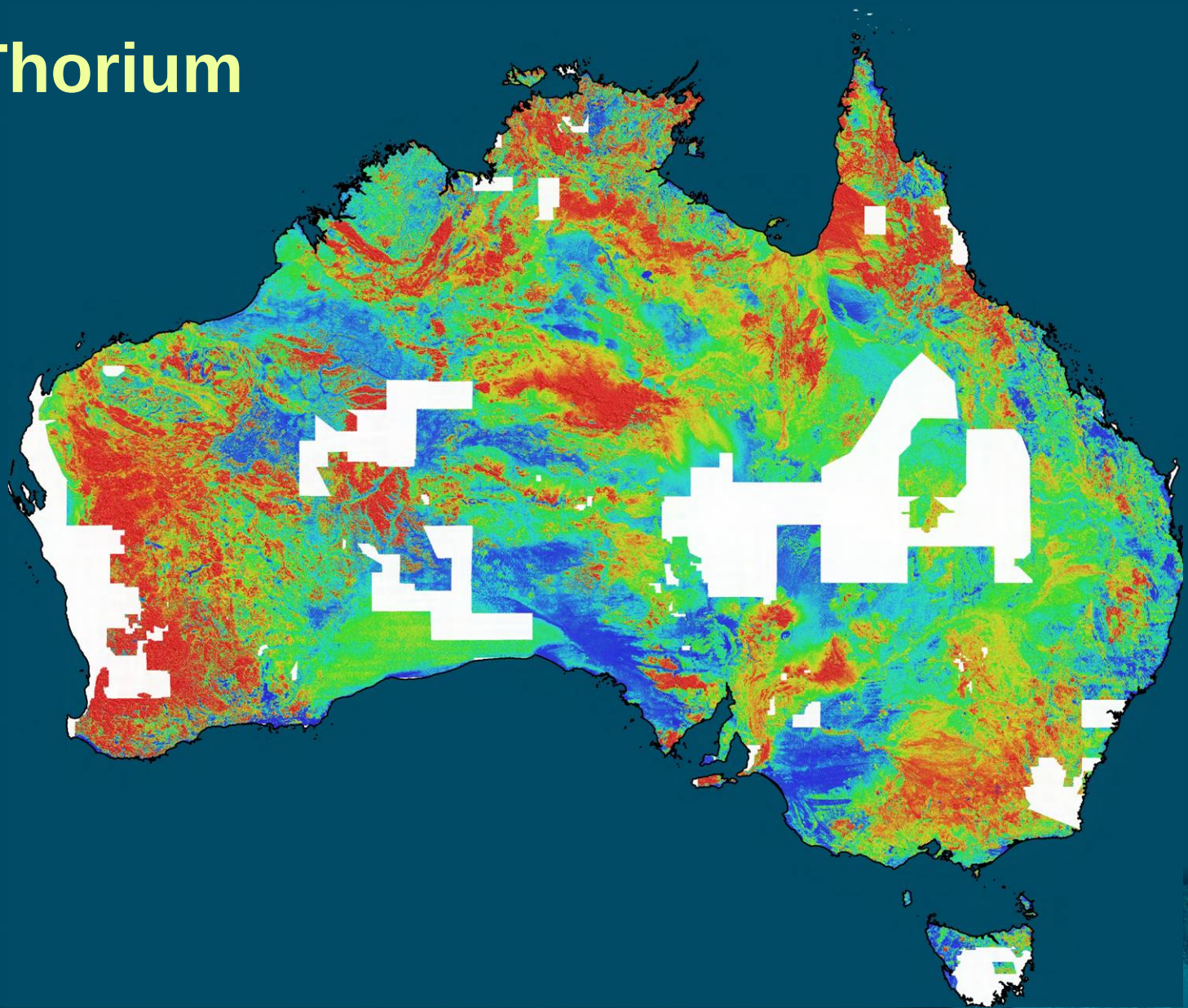
Potassium



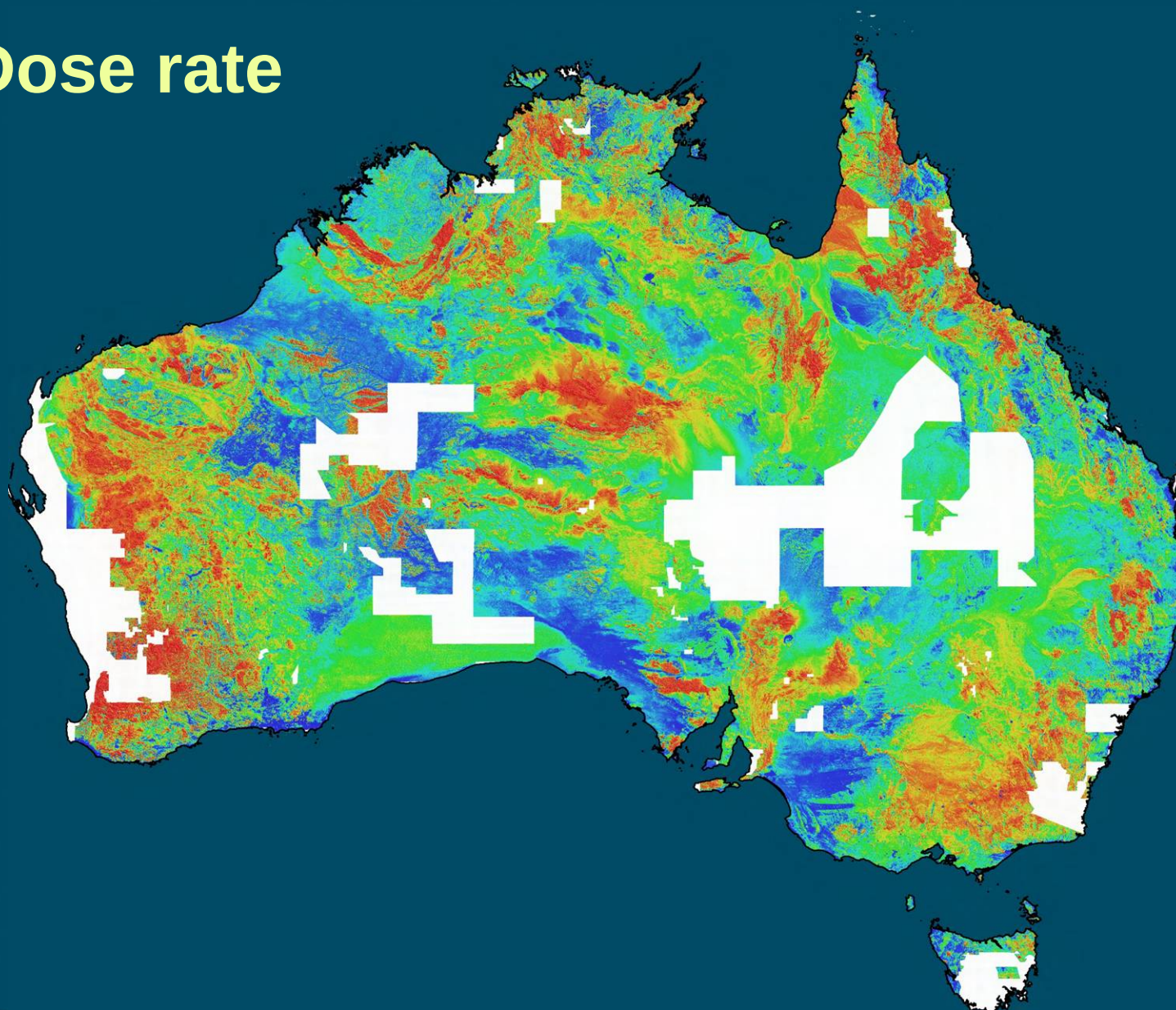
Uranium



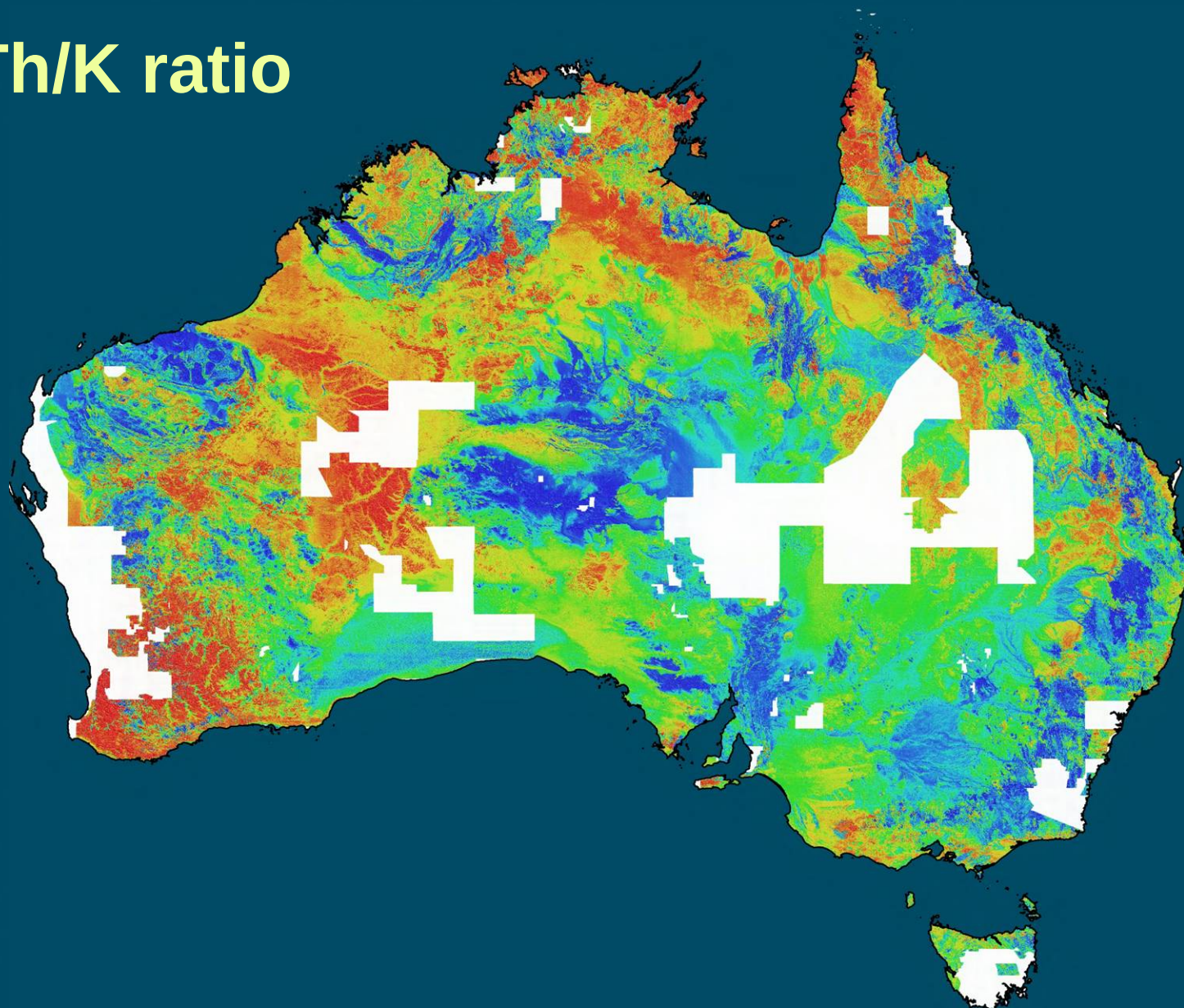
Thorium



Dose rate



Th/K ratio



Ternary



North Flinders Ranges, South Australia



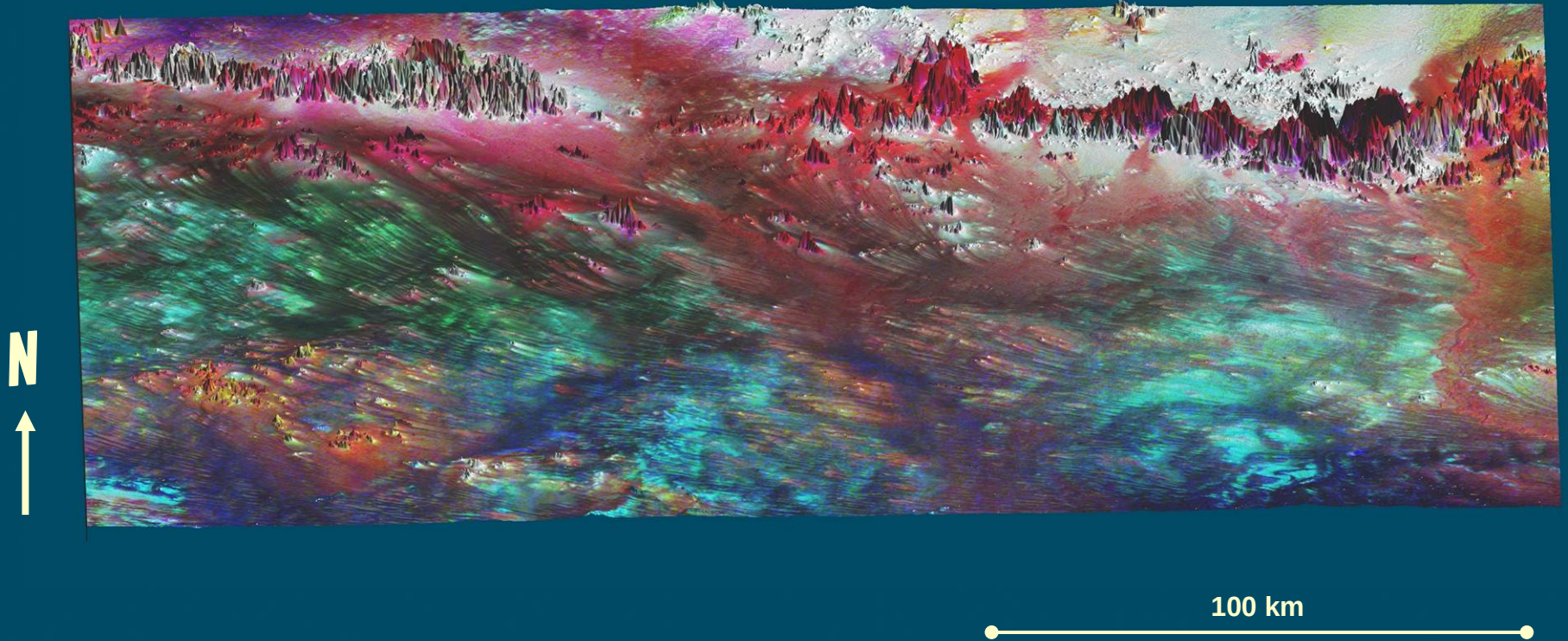
Central Australia



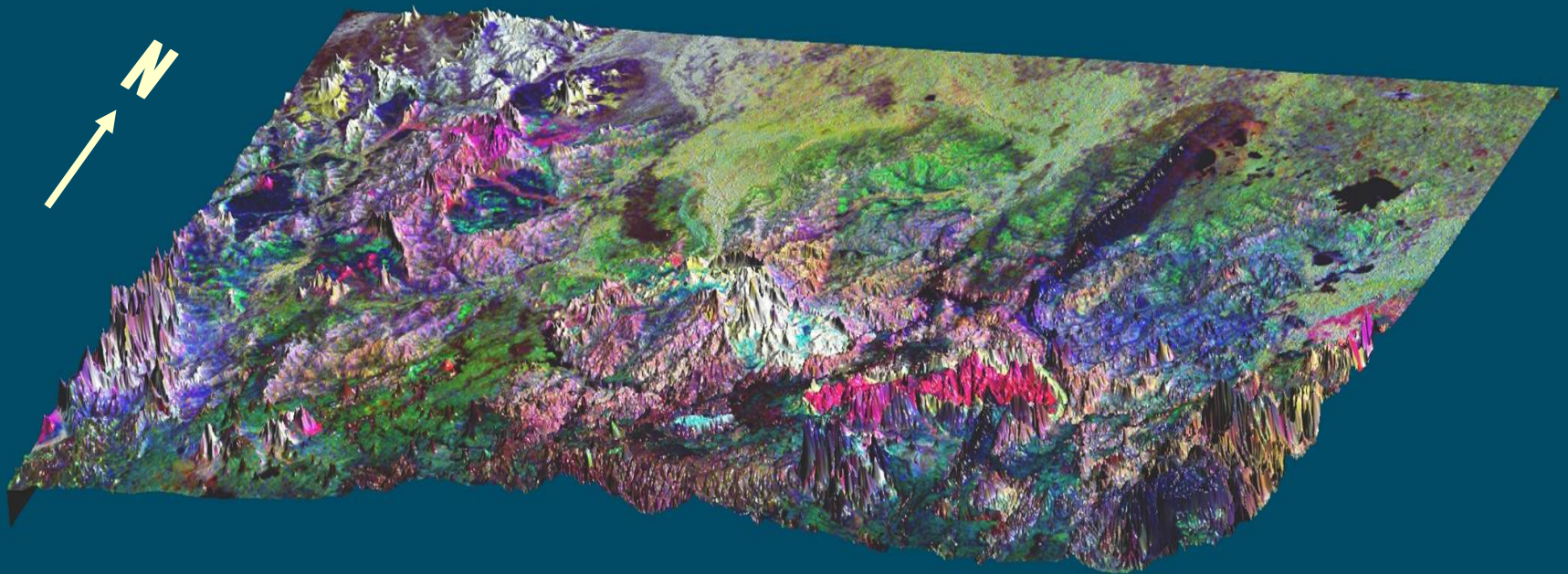
Mount Isa Block, Queensland



Musgrave Block, Northern Territory

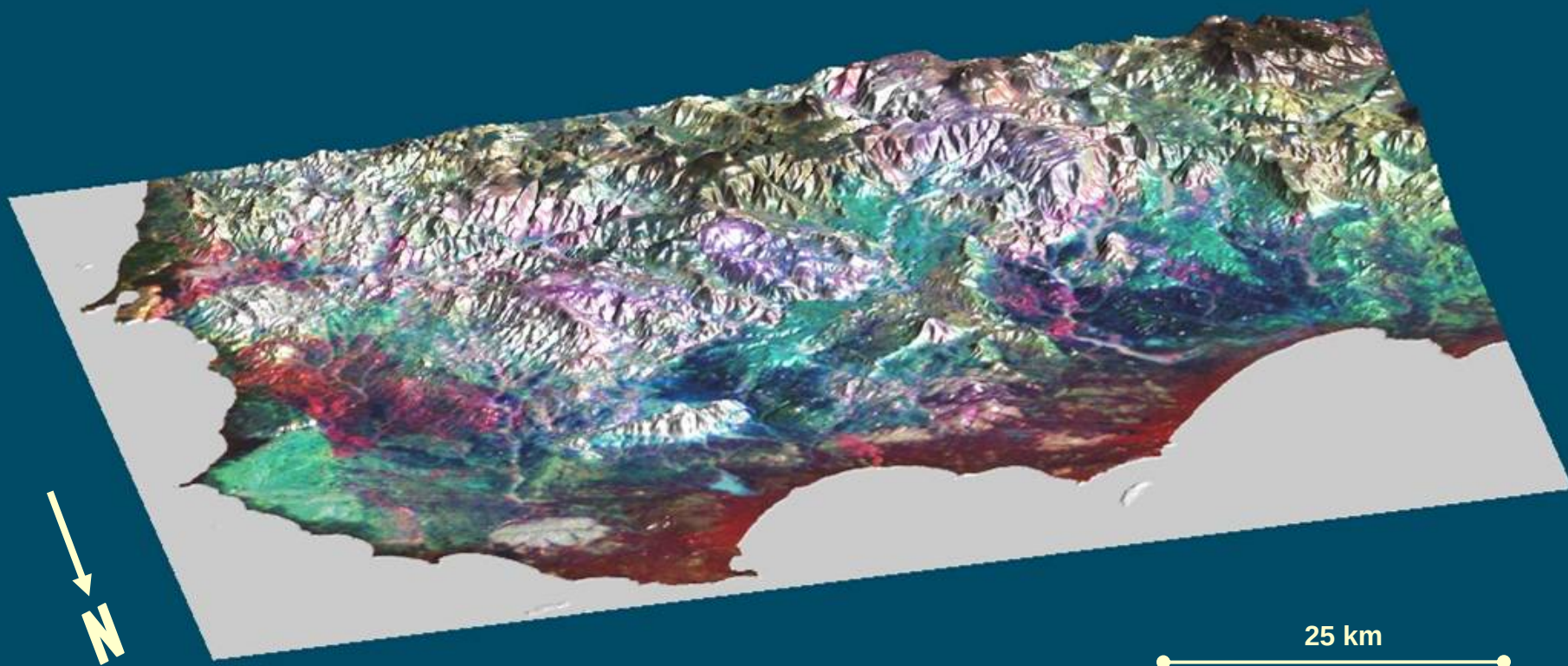


Central Victoria

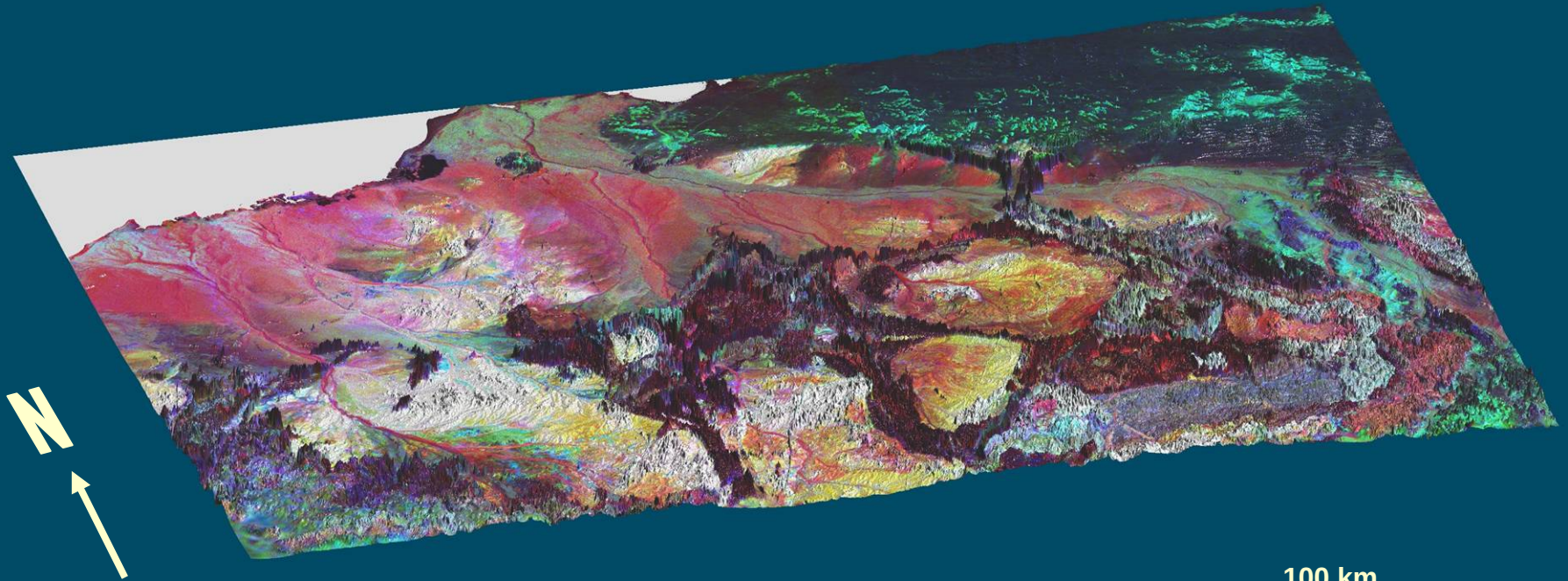


50 km

NE Tasmania



Pilbara, Western Australia



100 km

Acknowledgements



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