Pre-competitive geophysical data under the CORE initiative

Tania Dhu
Introduction

- Geophysical data are important tools for understanding regional geology
- NTGS is improving pre-competitive gravity coverage to a spacing of 4 km or better and magnetic and radiometric coverage to a line spacing of 400 m or better, focusing on the greater McArthur Basin (Close 2014) and the Amadeus Basin

The greater McArthur Basin (blue outline) is a regional correlation between the Palaeo- to Mesoproterozoic McArthur and Birrindudu basins and the Tomkinson Province covering an area of approximately 550,000 km² in the northern NT.

The Amadeus Basin (red outline) is a Neoproterozoic to Palaeozoic elongate intracratonic basin covering approximately 170,000 km² in the southern NT.
**NT Magnetics and Radiometrics**

**Completed 2014: Dunmarra Magnetic and Radiometric Survey**
- 36,000 km², ~100,000 line km

**Prior to the CORE initiative the majority of the Territory was covered by magnetic and radiometric data with line spacing of 500 m or better by more than 5%**

**Planned 2015: Delamere and Spirit Hills Magnetic and Radiometric Survey**
- 36,000 km², ~100,000 line km
  - Delamere: 25,000 km², ~60,000 line km at 400 m line spacing
  - Spirit Hills: 8,000 km², ~20,000 line km at 400 m line spacing
NT Wide Magnetic & Radiometric Stitch (Clifton 2015)

Total Magnetic Intensity (TMI), Reduced to Pole (RTP)

Ternary Radiometrics
Dunmarra Magnetic and Radiometric Survey

greater McArthur Basin

Dunmarra Magnetic and Radiometric Survey

Beetaloo Sub-basin (Close 2014)

Interpreted extension of the Mallapunyah Fault zone (Bruna 2015)
Dunmarra Magnetic & Radiometric Survey

Reduced to Pole (RTP) Total Magnetic Intensity (TMI)

First Vertical Derivative (1VD) RTP TMI

Mallapunyah Fault zone
Beetaloo Sub-basin
Dunmarra Magnetic & Radiometric Survey

Upward continued 2000 m TMI RTP

Mallapunyah Fault zone

Beetaloo Sub-basin

Ternary radiometrics (K = blue, TH = green, U = blue)
NT gravity: up to 80% covered

Prior to the CORE initiative approximately 43.5% of the Territory covered by 4 km spaced gravity or better

Completed 2013: Southern McArthur Basin Gravity Survey
55,000 km², ~3500 stations

Completed 2013: Southern McArthur Basin Gravity Survey
75,000 km², ~6000 stations

Completed 2014: Northern McArthur Basin Gravity Survey
70,000 km², ~7000 stations

Completed 2013: Southern McArthur Basin Gravity Survey
60,000 km², ~4500 stations

Completed 2015: West Amadeus Gravity Survey
45,000 km², ~8000 stations

Planned 2015: Victoria Basin Gravity Survey
100,000 km², ~6000 stations

Planned 2015: Northern Wiso Basin Gravity Survey
95,000 km², ~6000 stations

Proposed: Northwest McArthur Basin Gravity Survey
55,000 km², ~3000 stations

Proposed: South Nicholson Basin Gravity Survey
25,000 km², ~1600 stations

Proposed: Daly Basin Gravity Survey
55,000 km², ~3500 stations

Proposed: South Nicholson Basin Gravity Survey
55,000 km², ~3000 stations
Gravity: greater McArthur Basin

- Greater McArthur Basin Gravity Survey
- Urapunga Fault Zone
- Batten Fault Zone
- Walker Fault Zone
- Southern McArthur Basin Gravity Survey
- Beetaloo Sub-basin
- Mallapunyah Fault zone
- 1:2500000 Faults
- Barkly Gravity Survey
- Tennant Creek Gravity Survey
greater McArthur Basin: old data
greater McArthur Basin gravity: new data

Gravity Station Locations

Bouguer Anomaly

Northern Territory Government

AGES2015
greater McArthur Basin gravity: comparison

Bouguer Anomaly: old data

Bouguer Anomaly: new data
greater McArthur Basin gravity

Bouguer Anomaly: new data

Bouguer Anomaly: upward continued 2000 m
greater McArthur Basin gravity

Bouguer Anomaly: new data

Bouguer Anomaly: upward continued 5000 m
greater McArthur Basin gravity

Bouguer Anomaly: new data

Bouguer Anomaly: residual
greater McArthur Basin gravity

Bouguer Anomaly: new data

Bouguer Anomaly: residual
greater McArthur Basin gravity
greater McArthur Basin gravity

Bouguer Anomaly: new data

Bouguer Anomaly: total horizontal derivative

Northern Territory Government

AGES2015
Amadeus Basin gravity

Warrumpi Province

Musgraves Province

Mesozoic-Cenozoic

Neoproterozoic-Palaeozoic

Palaeo-Mesoproterozoic Basins

Palaeo-Mesoproterozoic Orogens

Archean

Northern Territory Government

AGES2015
Amadeus Basin: old data

Gravity Station Locations
Amadeus Basin: old data

Bouguer Anomaly
Amadeus Basin: new data

Gravity Station Locations
Amadeus Basin: new data

Bouguer Anomaly
Amadeus Basin: comparison

Bouguer Anomaly: new data

Bouguer Anomaly: old data
Amadeus Basin: upward continued 2000 m
Amadeus Basin: upward continued 5000 m
Amadeus Basin: residual
Amadeus Basin: residual
Amadeus Basin: tilt derivative
Amadeus Basin: total horizontal derivative
Conclusion

- The NTGS is improving quality and resolution of precompetitive datasets on a regional scale within the greater McArthur and Amadeus basins.
