Integrated precompetitive geoscience transforming understanding of Northern Territory geology

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NTGS

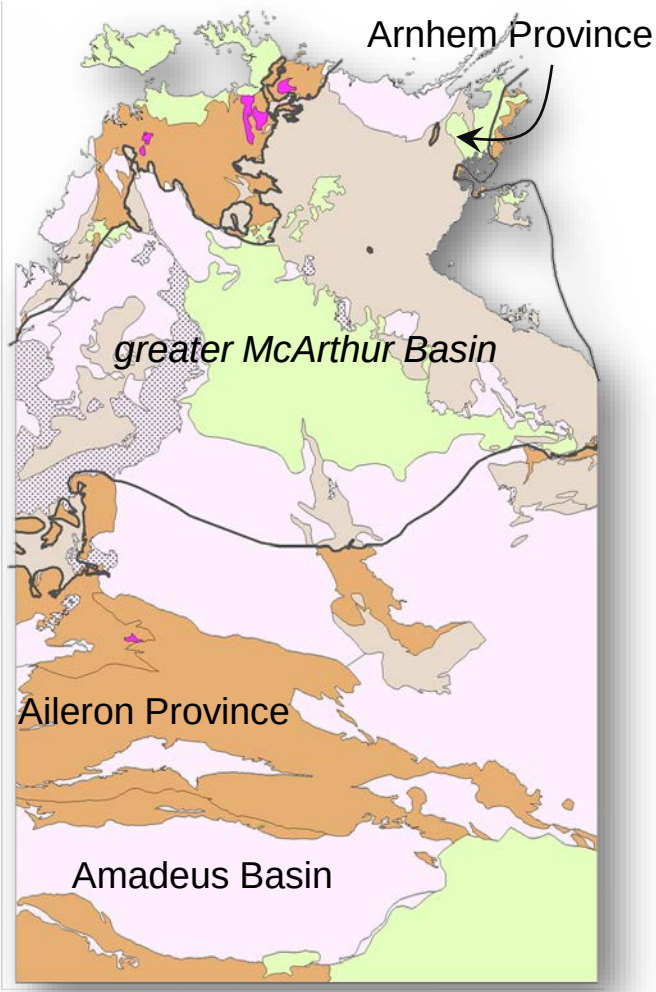
AUSTRALIA'S NORTHERN TERRITORY

NORTHERN TERRITORY GEOLOGICAL SURVEY
AGES2018
ANNUAL GEOSCIENCE EXPLORATION SEMINAR
Alice Springs, 20–21 March 2018, Northern Territory

Creating Opportunities for Resource Exploration

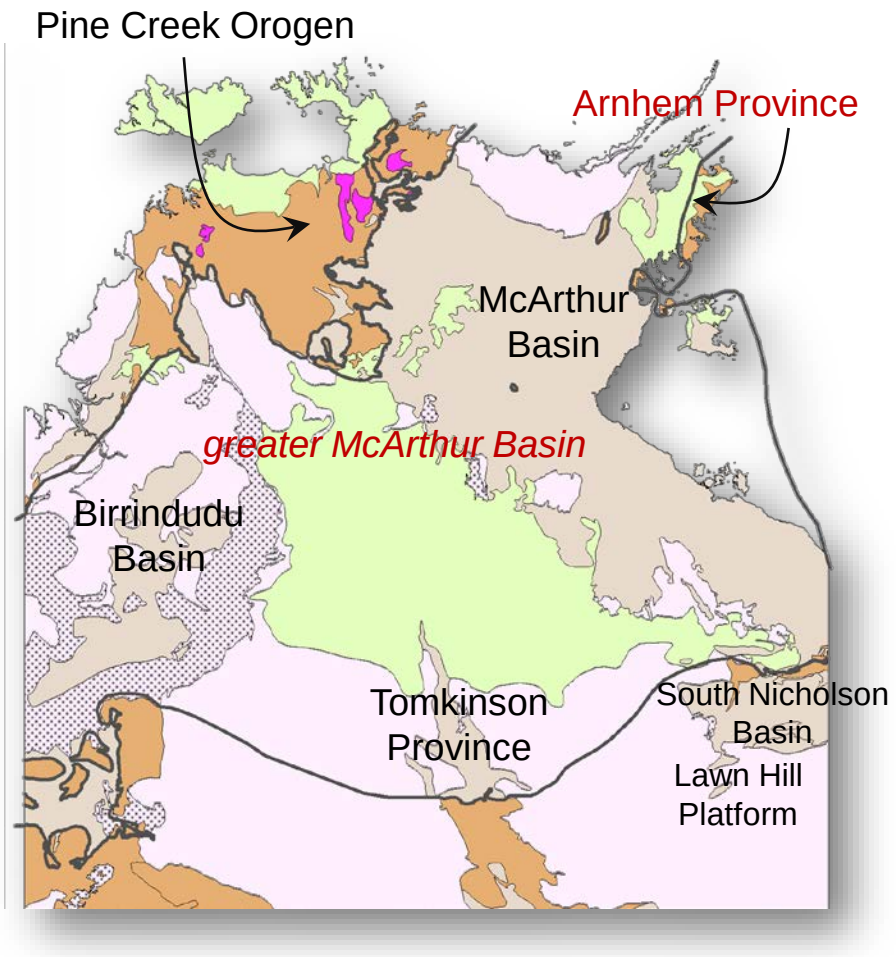
CORE

CORE initiative 2104-2018



- Strategic approach to key areas
- improving foundation datasets that have longevity (ie quality) and are multi-use (investment)
- Wholistic view to improve the understanding of the geological framework, providing context to targeted mineral and petroleum resource studies
- Integrated approach from regional to province to camp scale
- Broad collaborative approach to include broad range of datasets and knowledge
- Addressing key questions to transform the understanding of NT geology

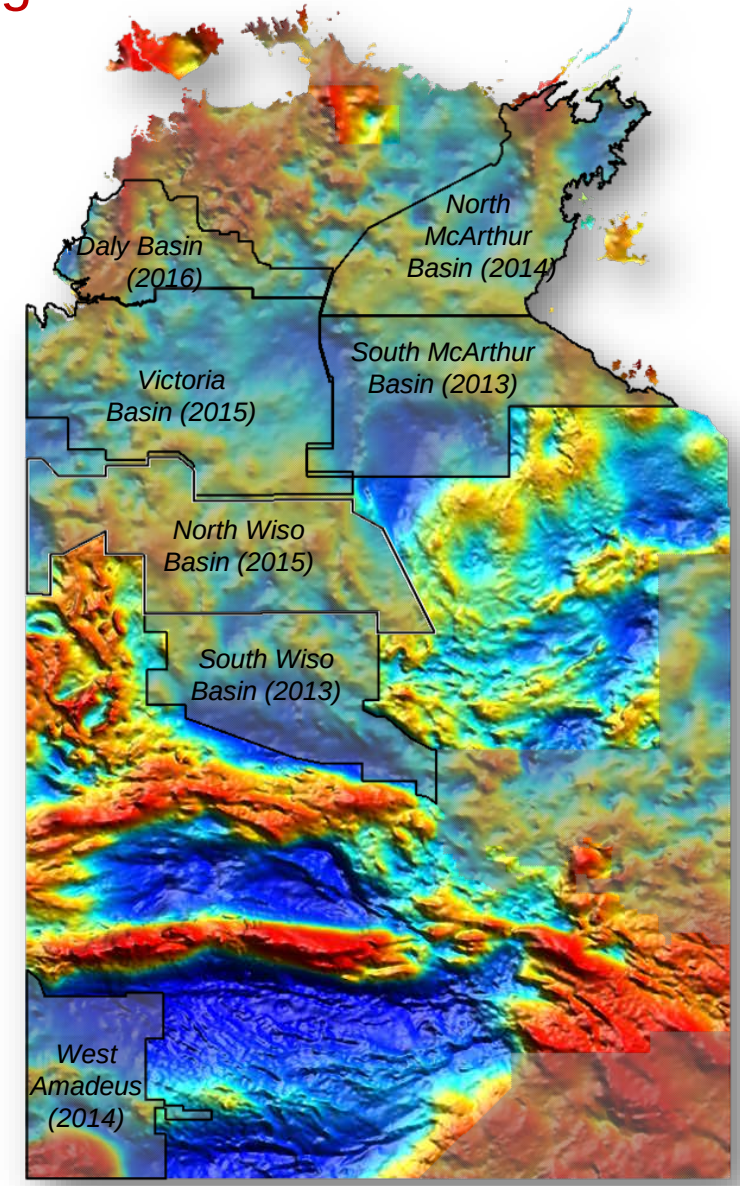
greater McArthur Basin/Arnhem Province: geological framework



Key questions

- Subsurface continuity between outcropping basins/provinces
- Regional scale unconformities indicating stacked basins
- Architectural evolution of basin/s over time, identification of growth faults/reactivated structures
- Depth to prospective stratigraphic units
- Nature of the underlying ‘basement’ & influence on basin/s evolution

greater McArthur Basin/Arnhem Province: geological framework

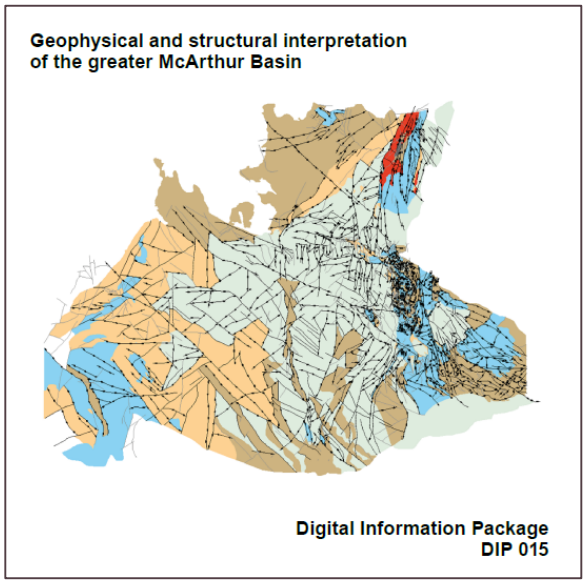


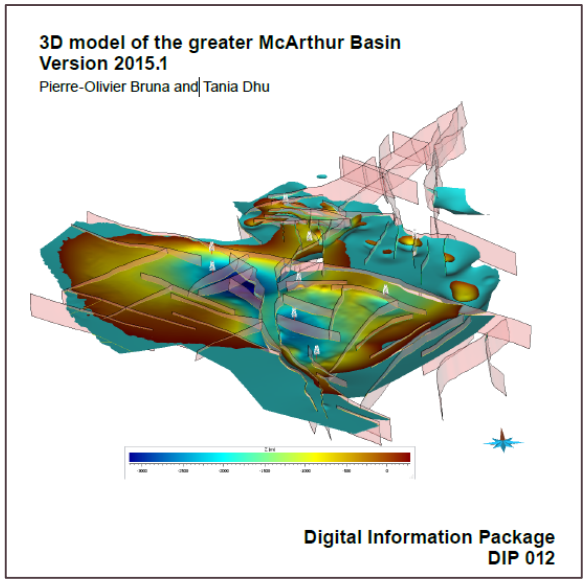
Approach: acquisition of new data to improve foundation data/information

- Majority of area now covered by 4km or better ground gravity & 400m line spaced aeromagnetic and radiometric data
- Extensive coverage of petrophysical properties of majority of stratigraphic units
- HyLogging of stratigraphically significant drill holes
- Systematic characterisation of stratigraphic units at type section localities
- 1:100k mapping of the Arnhem Province

Pre 2013 NT wide Bouguer Anomaly

greater McArthur Basin/Arnhem Province: geological framework



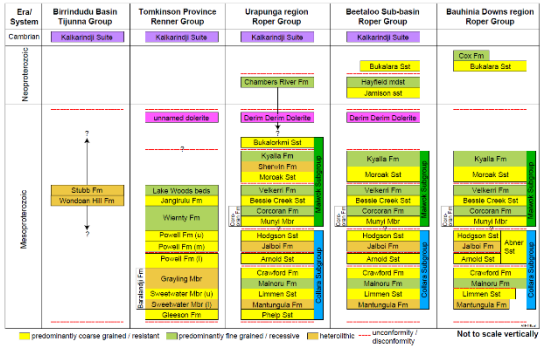


Integration – regional scale:

- Pre geophysical data acquisition under CORE; undertake regional scale geophysical and structural interpretation: integrating outcrop distribution and geophysical data (PGN Geoscience, DIP015) → providing structural framework, regional stress regimes, fault kinematics & basin inversion events

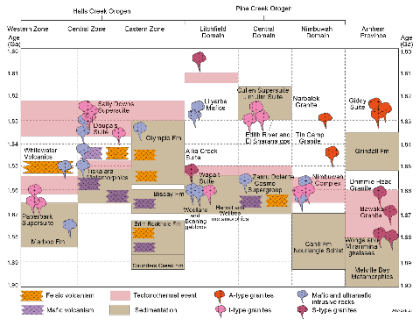
- Construct 3D model/s at a range of scales : integrating faults interpreted from geophysics, outcrop distribution, structural & well data, key seismic lines (NTGS DIP012) → providing 3D controls on basin architecture, depth & volume of key stratigraphic units

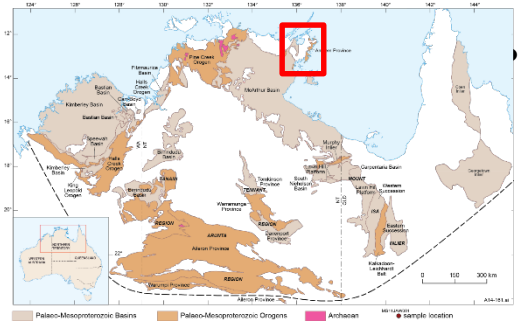
greater McArthur Basin/Arnhem Province: geological framework



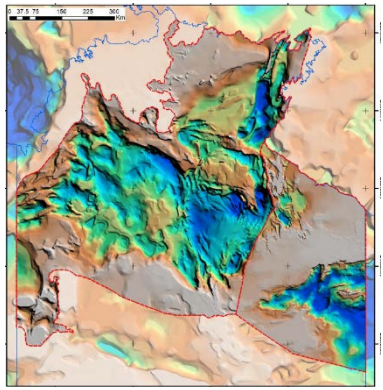
Integration – regional scale

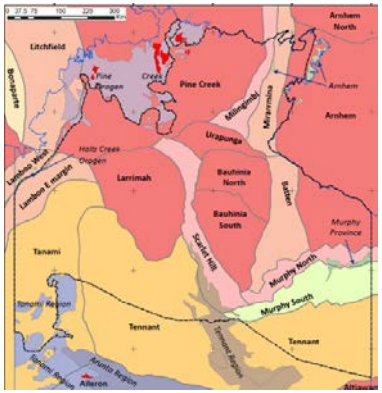
- Stratigraphic correlation across outcropping age equivalent units within greater McArthur Basin (NTGS, Record 2016-003)





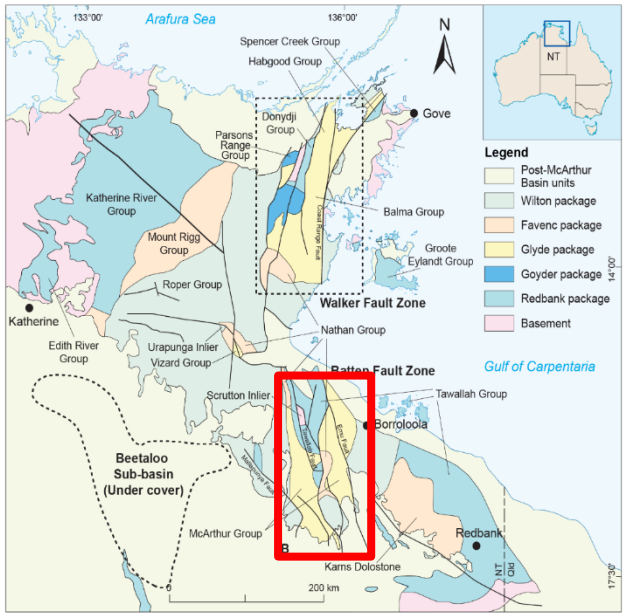
- Correlation and contrast PCO and Arnhem Province to understand underlying NAC basement (NTGS, AGES 2017 Proceedings)

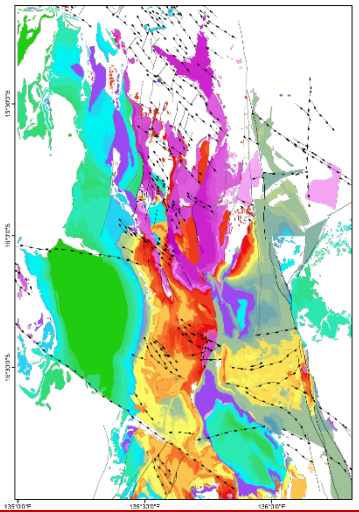


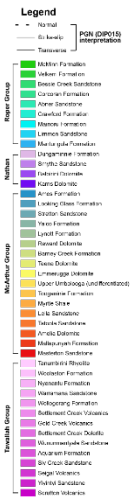


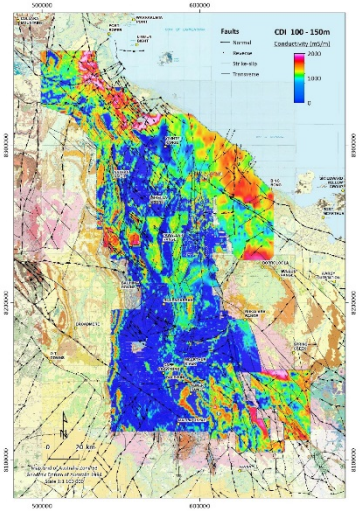
- SEEBASE® interpretation incorporating new geophysical datasets and legacy seismic to determine regional scale depth to key surfaces and nature an influence of underlying basement (Frogtech Geoscience, DIP017)

greater McArthur Basin/Arnhem Province: geological framework





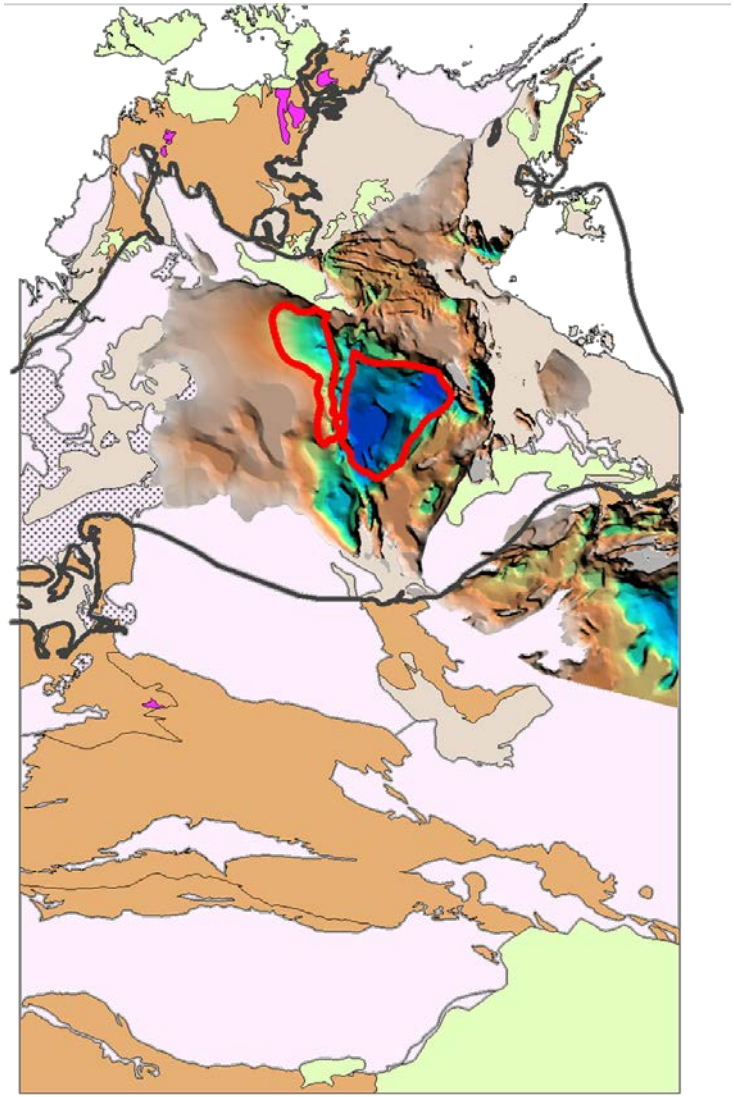




Integration – province scale

- Incorporation of updated regional scale potential field data and petrophysical data to model sub-basin architecture in the Batten Fault Zone (CSIRO collaboration, AGES 2017 Proceedings)
- Legacy AEM incorporated with outcrop distribution to assess depth to key prospective stratigraphic horizons ie Barney Creek Form^{n} (CSIRO collaboration, AGES 2017 Proceedings)

greater McArthur Basin/Arnhem Province: geological framework

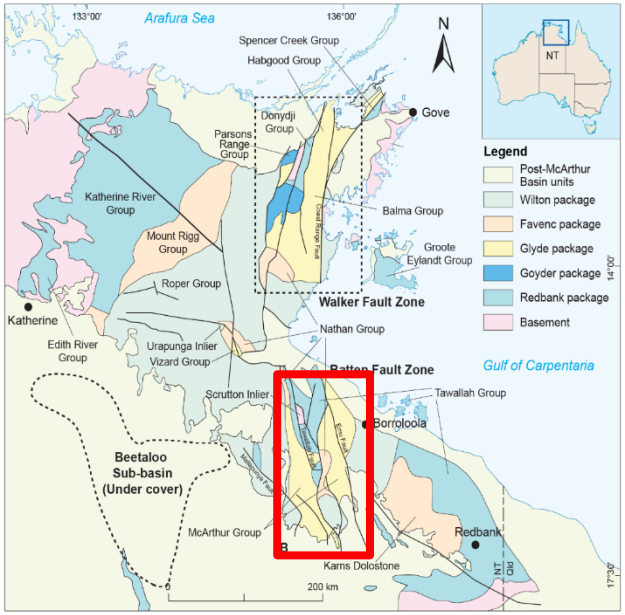


Integration – province scale

- Incorporation of updated regional scale potential field data, industry seismic & well data, SEEBASE ® interpretation to provide best constrained boundary of concealed Beetaloo Sub-basin (NTGS, Record in prep)

- detailed stratigraphic correlation within the Mesoproterozoic Roper Group integrating and complimenting NTGS regional scale program (ARC Linkage-Uni Adelaide, AGES 2018 Proceedings)

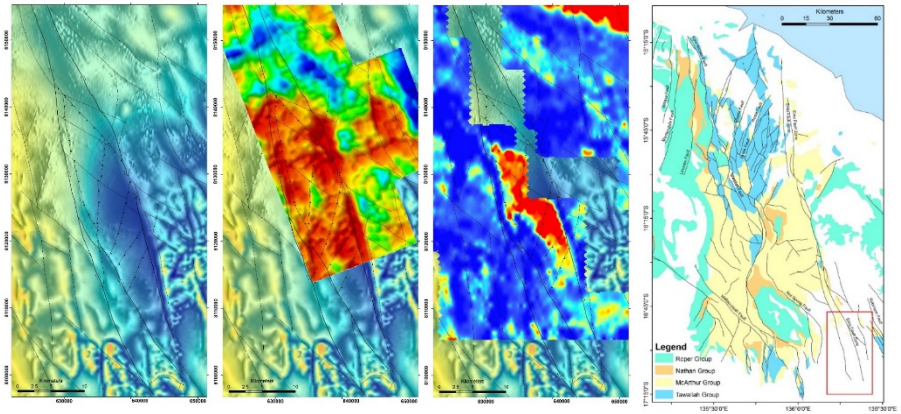
greater McArthur Basin/Arnhem Province: geological framework

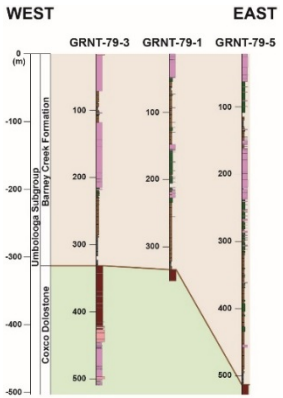


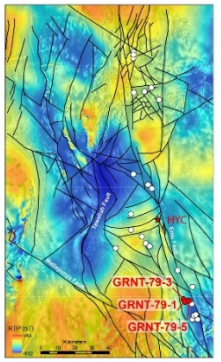
Integration – camp scale

- 1 km spaced ground gravity, AEM and petrophysical data to determine sub-basin architecture (CSIRO collaboration, AGES 2018 Proceedings)

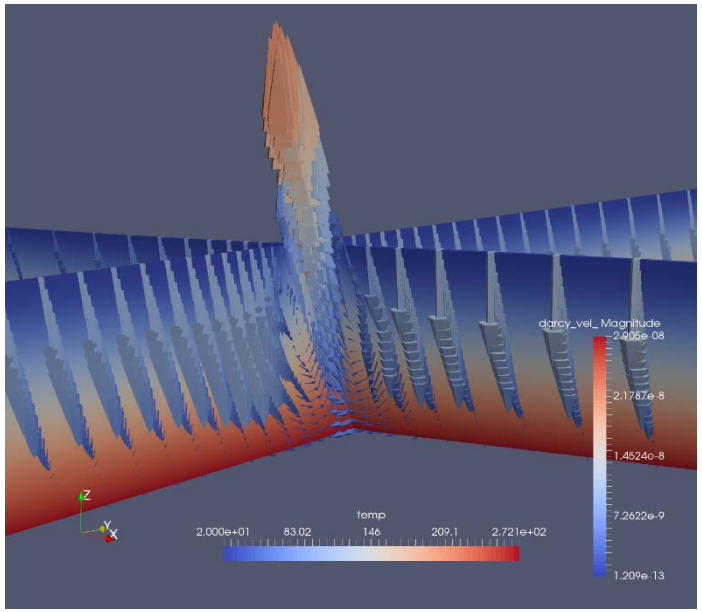
- Detailed lithological logging of drillcore within sub-basin to determine deposition environment, sequence stratigraphic analysis and intrabasinal correlation (CSIRO collaboration, AGES 2018 Proceedings)







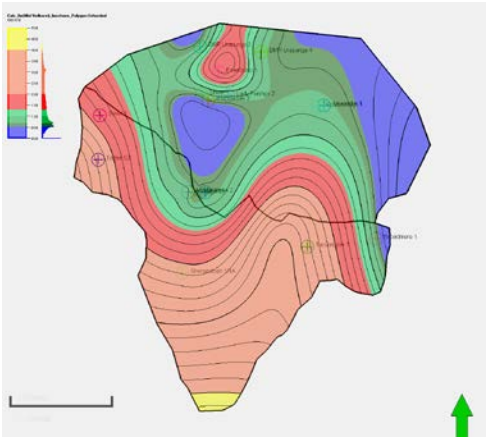
greater McArthur Basin/Arnhem Province: mineral and petroleum potential

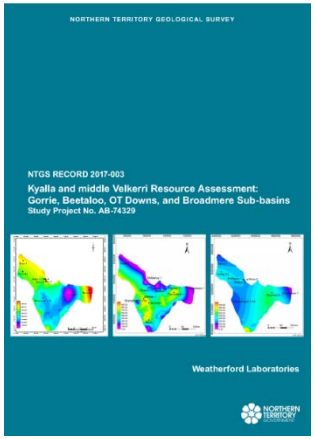


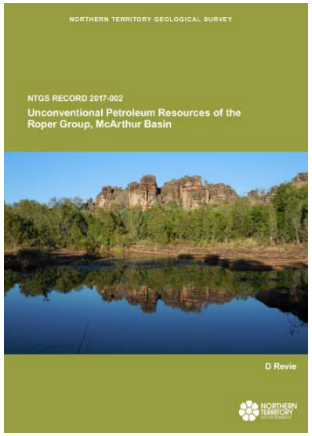
Integration – province scale

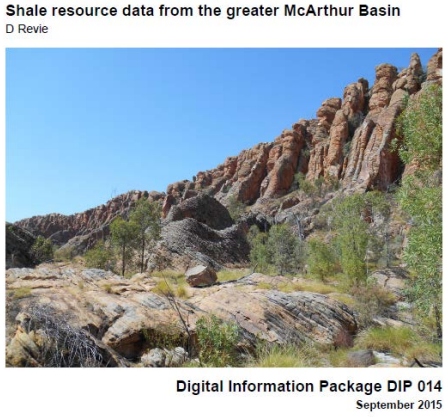
- Batten Fault Zone – integration of structural interpretation, growth faults, basin fill and isotopic characteristics to undertake fluid flow modelling, distal footprints, vectoring tools (CSIRO collaboration, AGES 2018 Proceedings)

- Beetaloo Sub-basin - shale gas resource assessment, base line data collection and compilation (NTGS, DIP014)

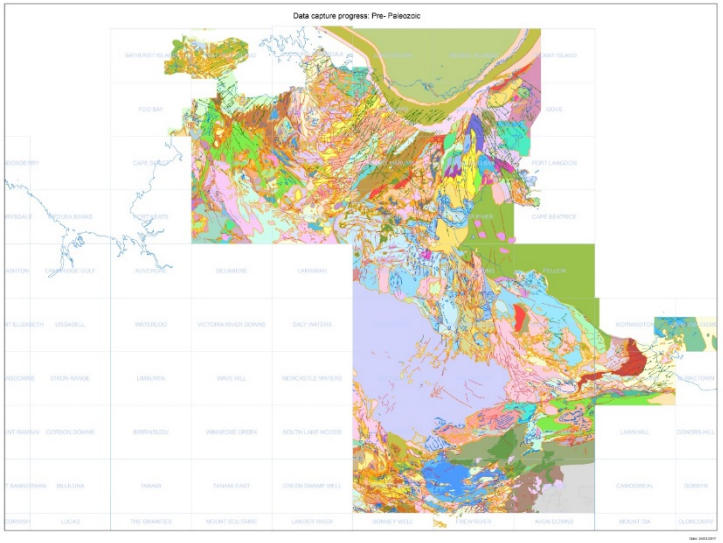


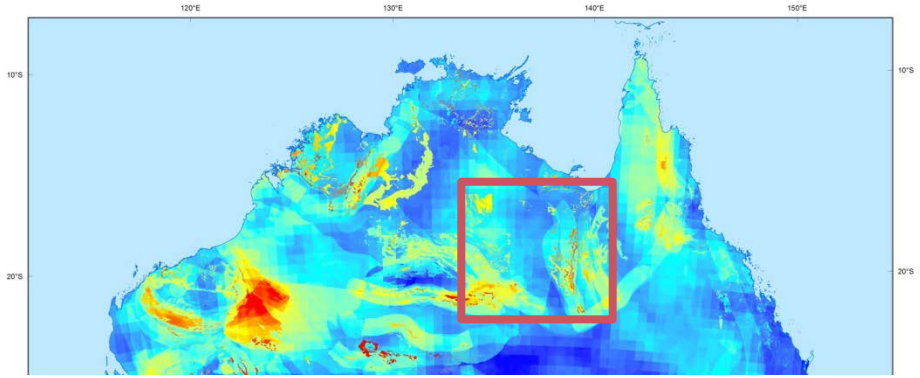






Beyond greater McArthur Basin/Arnhem Province: mineral and petroleum potential

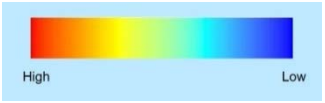




Acquisition and integration – regional scale

- Exploring for the Future program (Geoscience Australia) – extending the geological framework from the greater McArthur Basin to the South Nicholson & Lawn Hill Platform (Geoscience Australia, AGES 2018 Proceedings)
- 1:250k mapping Mount Drummond (South Nicholson Basin, Lawn Hill Platform) and continue to update 3D models incorporating new surface & subsurface data

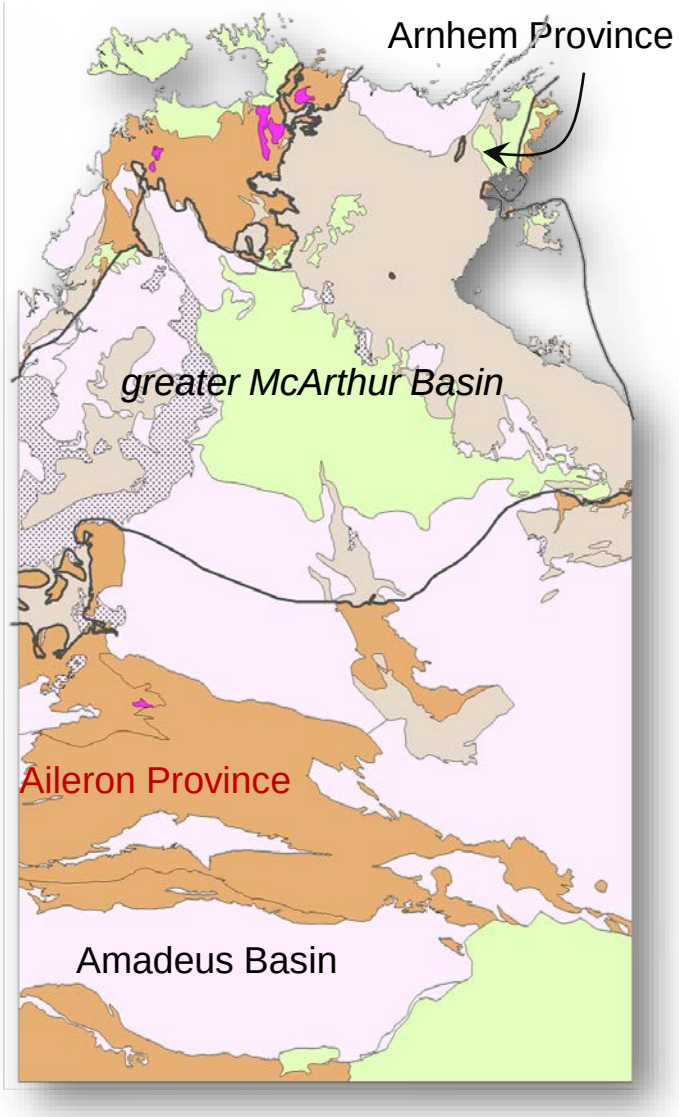
Mineral Potential



Australian Government
Geoscience Australia

Exploring for the Future
minerals | energy | groundwater

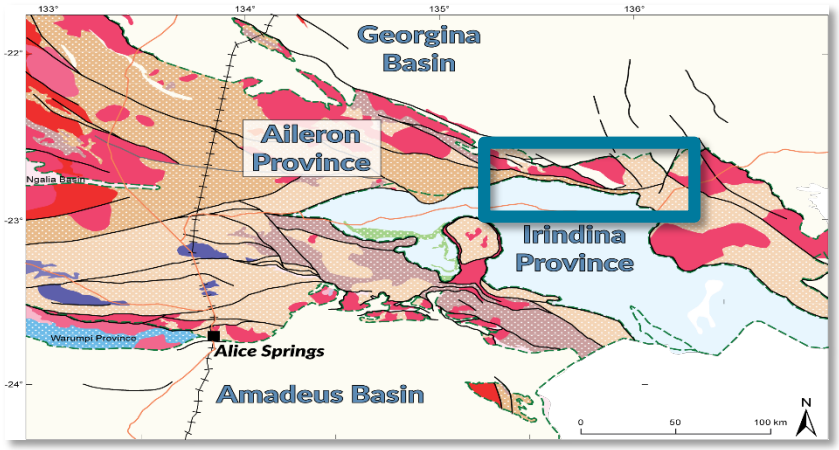
Aileron Province: geological framework and mineral systems

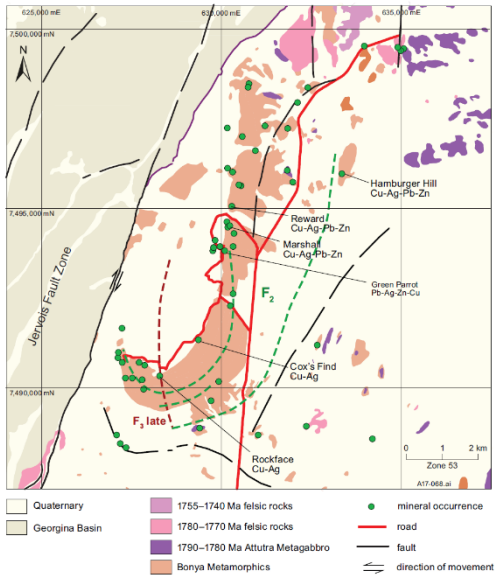


Key questions

- Distribution and extent of key depositional packages, magmatic, structural and metamorphic events
- Tectonic setting for major deformational and/or thermal events
- Characteristics of major Cu – bearing base metal deposits

Aileron Province: geological framework and mineral systems

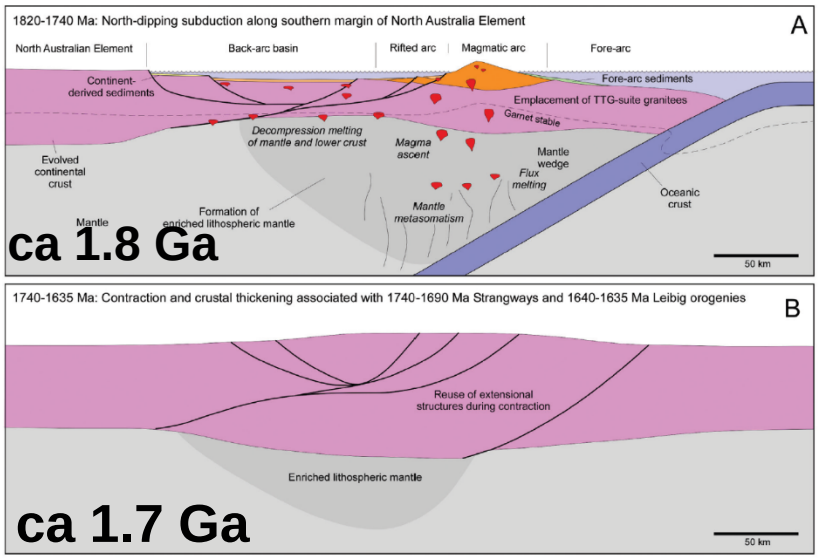




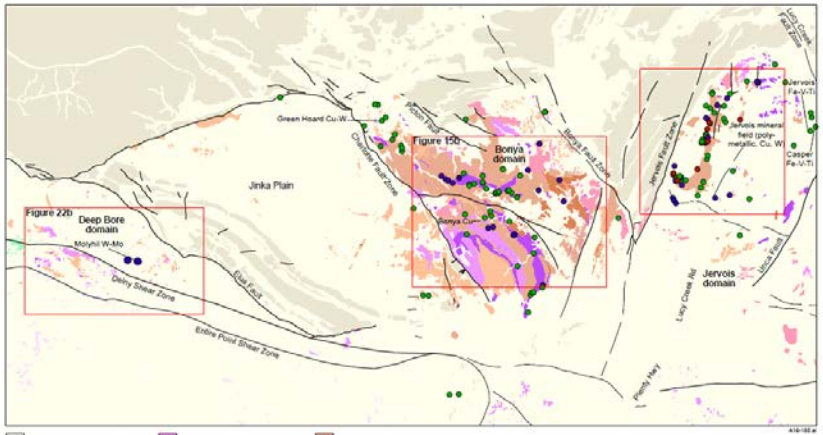
Approach: acquisition of new data improving foundation datasets

- 1:100k mapping of the eastern Aileron Province utilising systematic analytical techniques for age determination, whole rock geochemistry, isotopic analysis, fluid inclusions (NTGS, AGES 2017 Proceedings)
- Systematic approach to characterising copper bearing deposits & prospects to form basis for comparison of operating mineral systems (NTGS, AGES 2017 Proceedings)

Aileron Province: geological framework and mineral systems



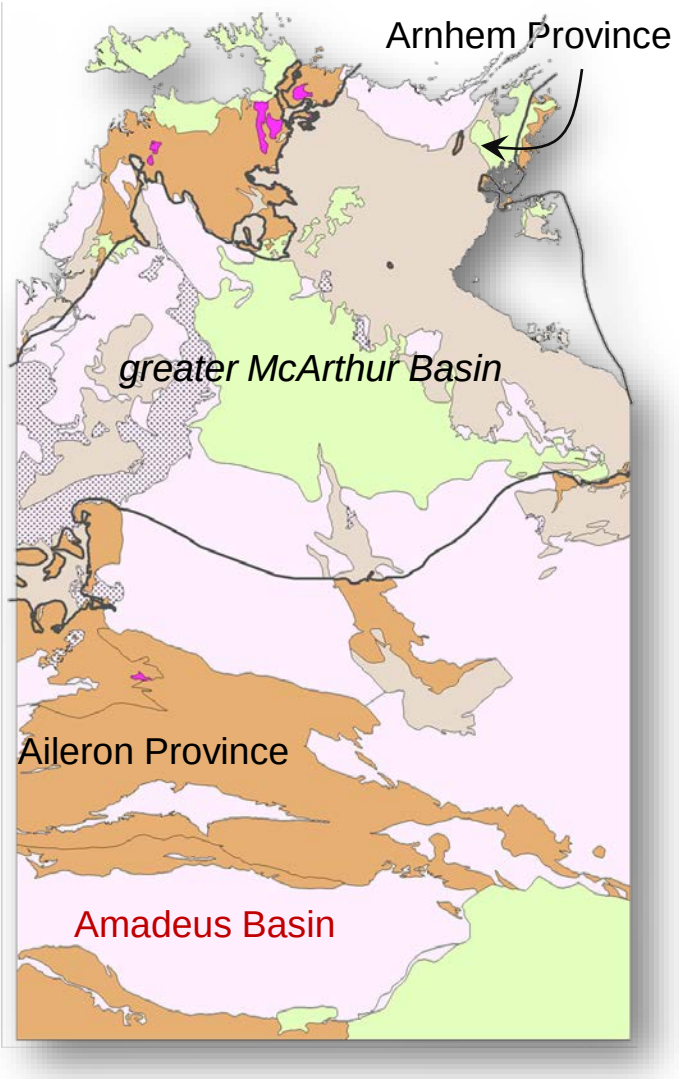
Huston et al 2017



Integration – camp to province to regional scale

- Geological framework and tectonic setting for base metal mineralisation at Jervois mineral field determined to represent syn sedimentary Cu-Ag-Pb-Zn mineralisation assoc with high thermal gradient metamorphism and bimodal magmatism in a back-arc setting at 1.79 Ga (NTGS, AGES 2017 Proceedings)
- Epigentic Cu-bearing mineralisation associated with magnetite-chlorite alteration observed at Jervois mineral field is present in other prospects across the Aileron Province (NTGS, AGES 2017 Proceedings)

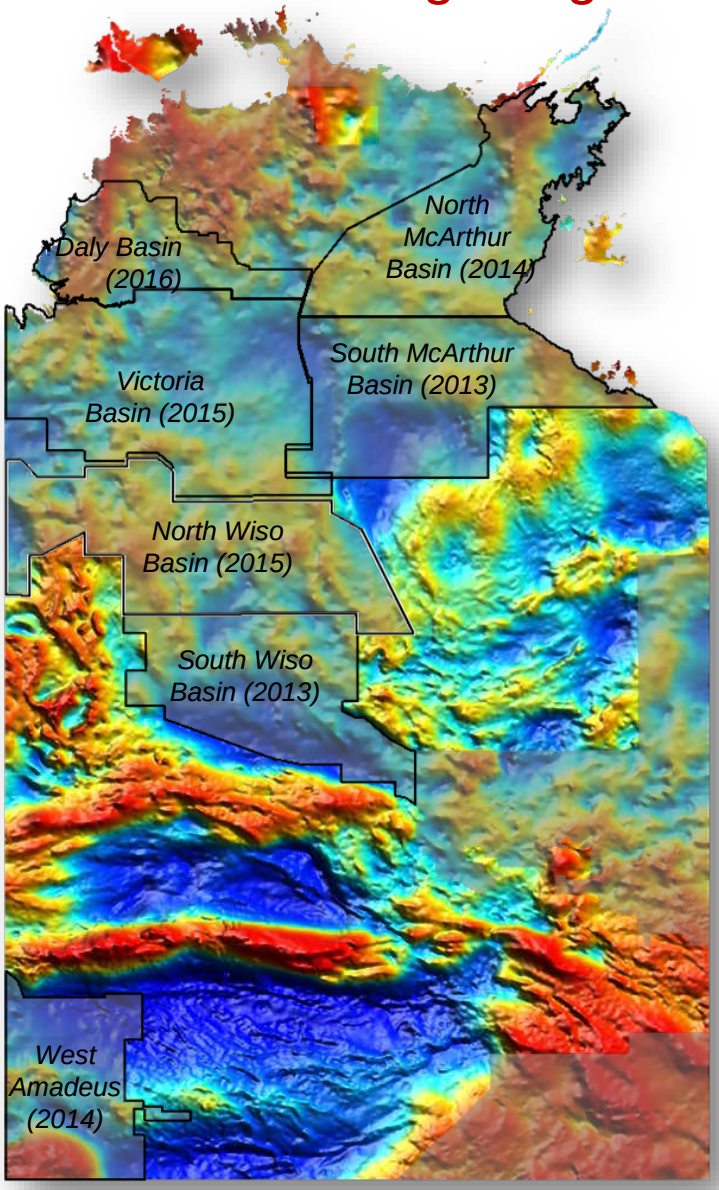
Amadeus Basin: geological framework



Key questions

- Stratigraphic definition of Neoproterozoic units, basin-wide extent, thickness and paleogeography
- Structural overprints and deformation intensity, influence of halotectonics and tectonic events
- Nature of the evolving basin architecture – evidence for regional scale unconformities?

Amadeus Basin: geological framework

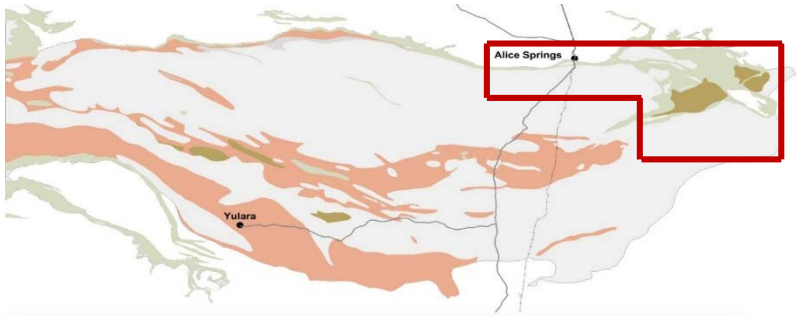


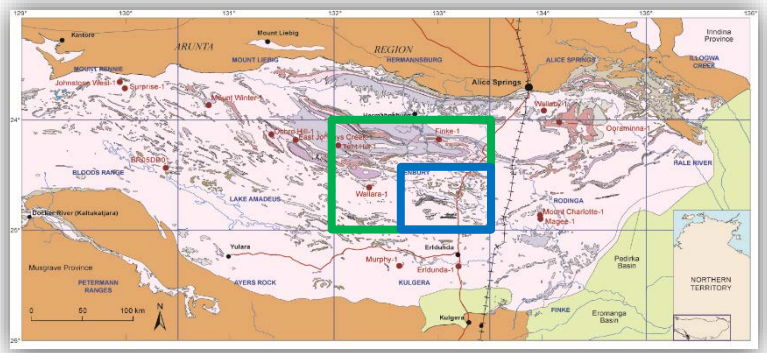
Approach: acquisition of new data improving foundation datasets

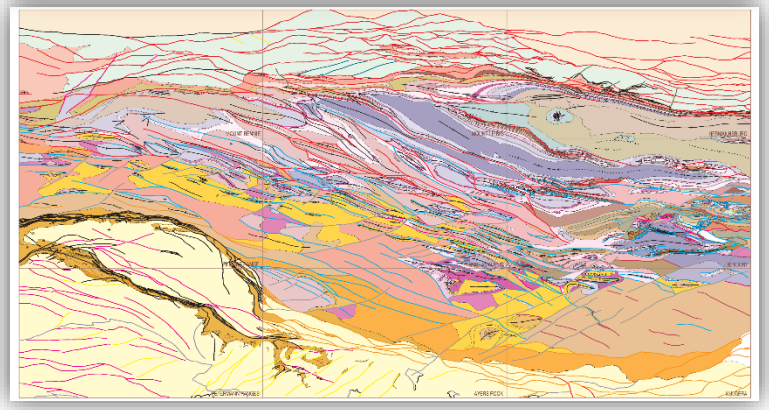
- Basin-wide coverage of 4km or better ground gravity
- Systematic characterisation of Neoproterozoic stratigraphic units
- 1:250k and 1:100k mapping of the central Amadeus Basin
- 1:500k basin-wide pre-Mesozoic interpreted geology

Pre 2013 NT wide Bouguer Anomaly

Amadeus Basin: geological framework







Integration – province to regional scale

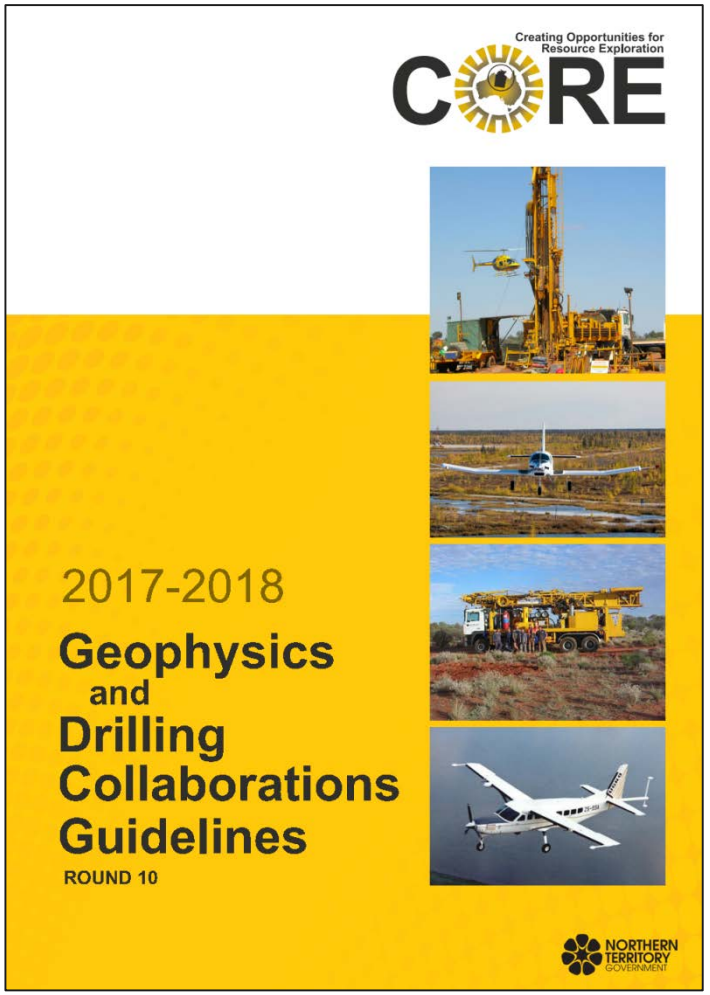
- Characterisation and redefinition of Neoproterozoic stratigraphy used to map surface distribution on Henbury 1st ed 1:100 000 and Henbury 2nd ed1:250 000 mapsheets (NTGS, AGES 2015 Proceedings, AGES 2017 Proceedings)

- Revised stratigraphic distribution used to improve understanding of deformation and structural architecture at outcrop level leading to interpretation of magnetic data to produce 1:500 000 basin wide pre Mesozoic interpreted geology (NTGS, AGES 2018 Proceedings)

Geophysics and Drilling Collaboration program

- Co-funding of greenfields exploration programs
- Program funded through 4 year initiative cycles
- Budget announcement in early May 2018
- Applications for funding open early May – successful applicants announced in June
- Updated information provided through website:

www.minerals.nt.gov.au/collaborations



Summary

- Integrated approach under the CORE initiative, targeting key areas
- New precompetative geoscience data: foundation datasets and information
- Increased collaboration with research organisations maximising interpretation
- Providing new insights to Territory geology and resource potential