Australian Government
Geoscience Australia

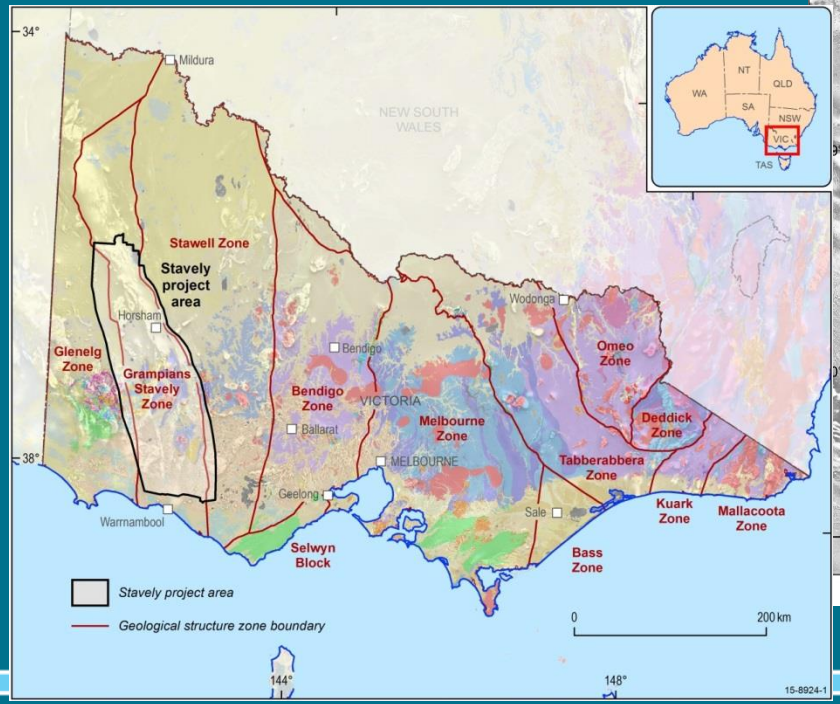
Cover and UNCOVER: an update on new science at Geoscience Australia

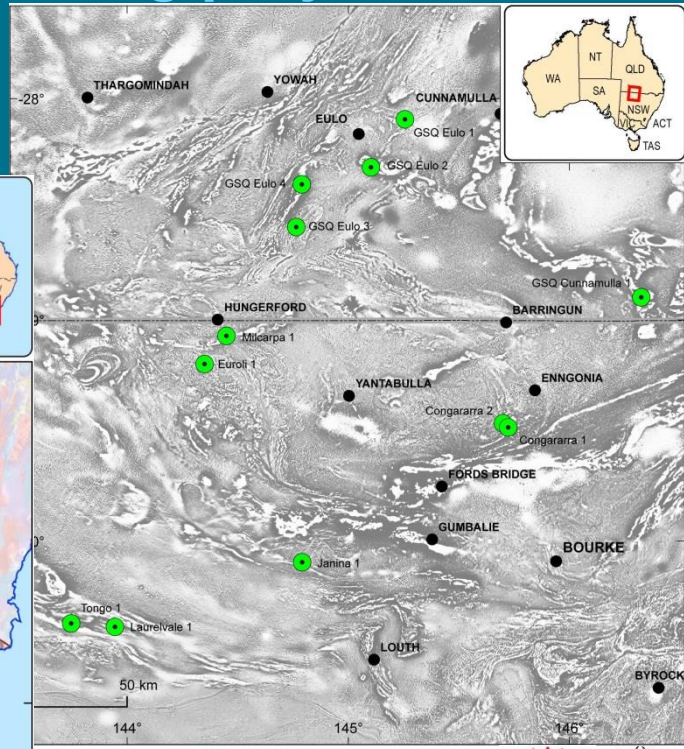
Ian Roach, Yusen Ley-Cooper, John Wilford, Karol Czarnota and Andrew McPherson

Stavely and Thomson Stratigraphic drilling projects

Stratigraphic drilling programs through cover to:

- Provide new pre-competitive data
- Stimulate mineral exploration investment
- Reduce exploration risk





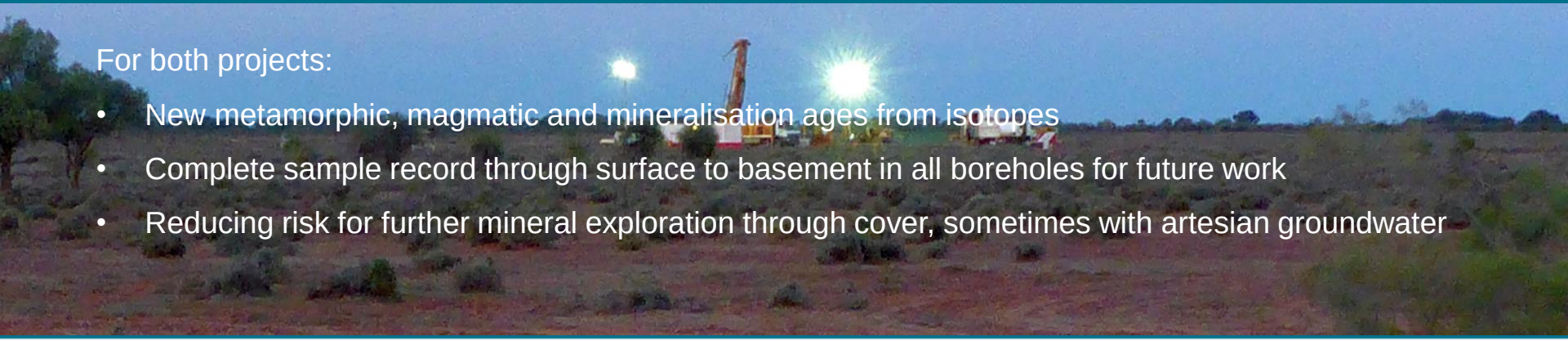
Stavely and Thomson Stratigraphic drilling results

Stavely:

- Collaboration with DET CRC and GSV
- 14 boreholes successfully completed
- Samples of Cambrian volcanic arc rocks

Thomson:

- Collaboration with GSNSW and GSQ
- 12 boreholes successfully completed
- Samples of metamorphic background rocks and igneous intrusive & volcanic rocks
- Distal footprints of mineral systems through surface geochemistry



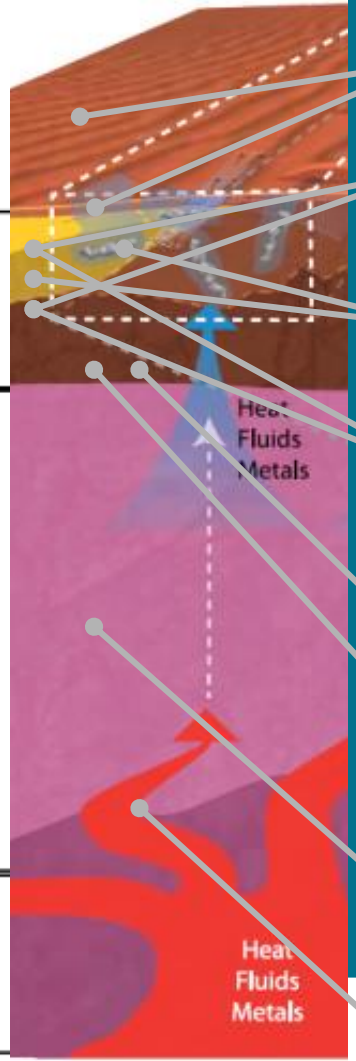
For both projects:

- New metamorphic, magmatic and mineralisation ages from isotopes
- Complete sample record through surface to basement in all boreholes for future work
- Reducing risk for further mineral exploration through cover, sometimes with artesian groundwater

Exploring For The Future (EFTF)

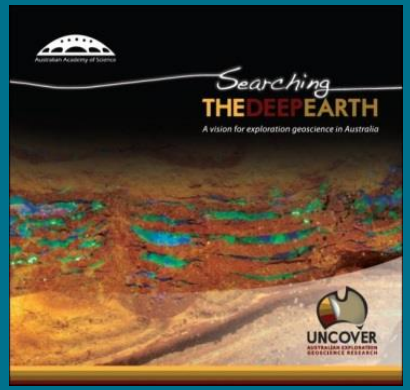
- Major $100.5M investment in pre-competitive geoscience from the Commonwealth Government (2016–2020).
- Build a resource prospectus of minerals, energy and groundwater to support northern Australia's future economic prosperity.
- Geoscience Australia is in collaboration with Queensland and Northern Territory government agencies, industry contractors and universities.
- Use innovative and integrated new data and knowledge generation to understand our natural resources in under-explored regions.





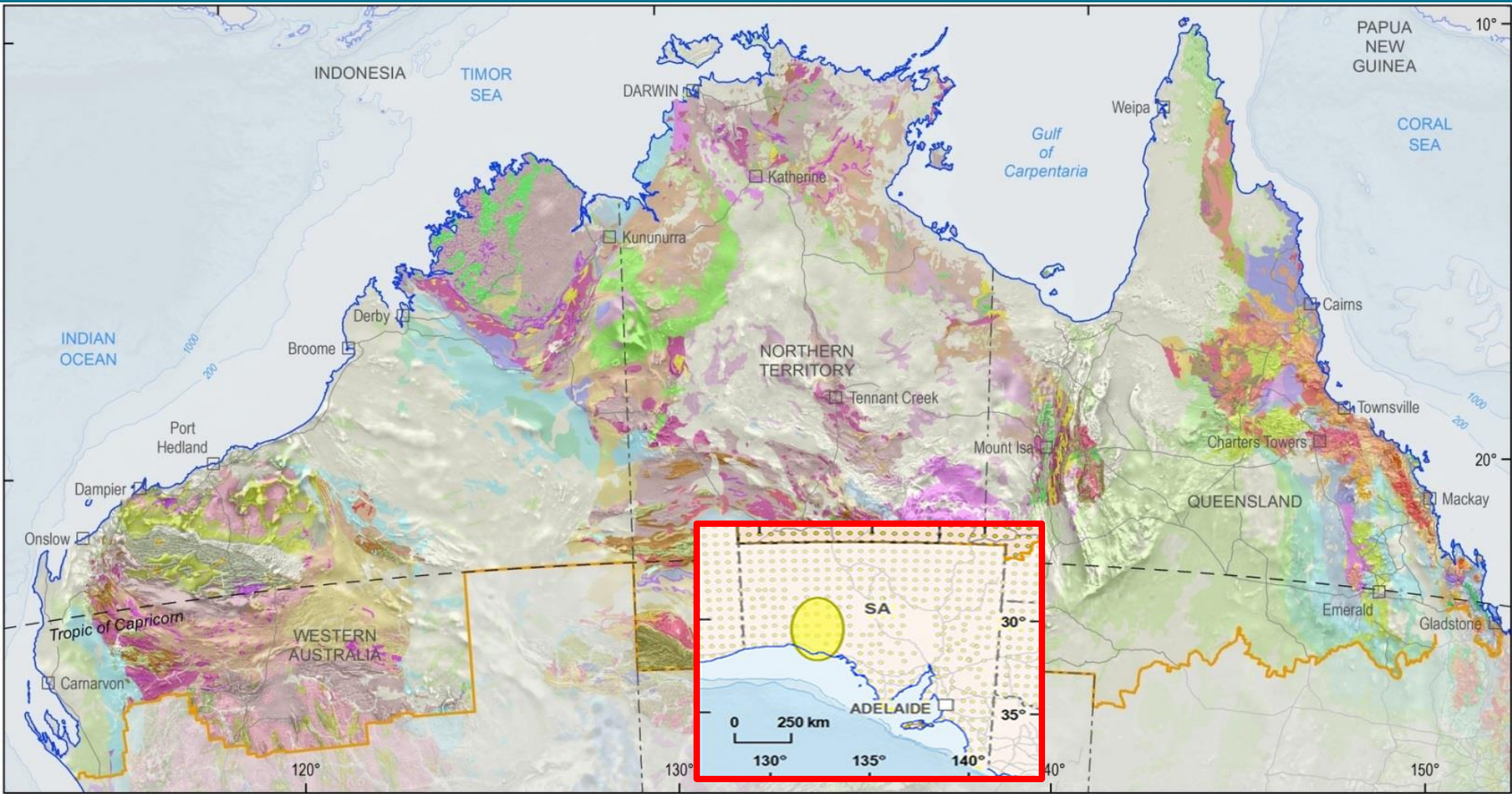
- Surface Chemistry
- Cover-thickness
- Groundwater Hydrochemistry
- Solid-geology
- Crustal Architecture
- Isotope Mapping
- Lithospheric Mantle Architecture
- Melts & Xenoliths

Mineral Systems Potential



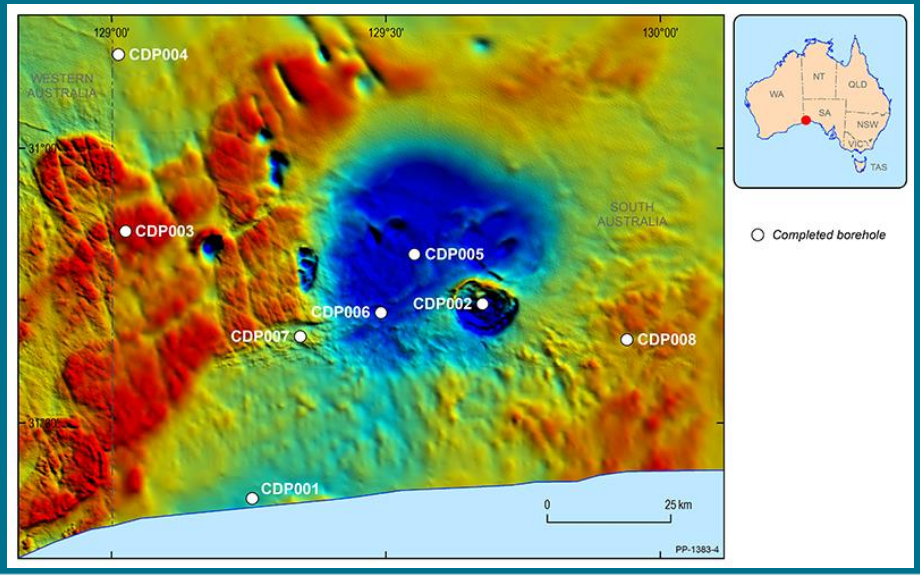
Amira Roadmap Highest & High Priorities

Northern Australia: Where is it?

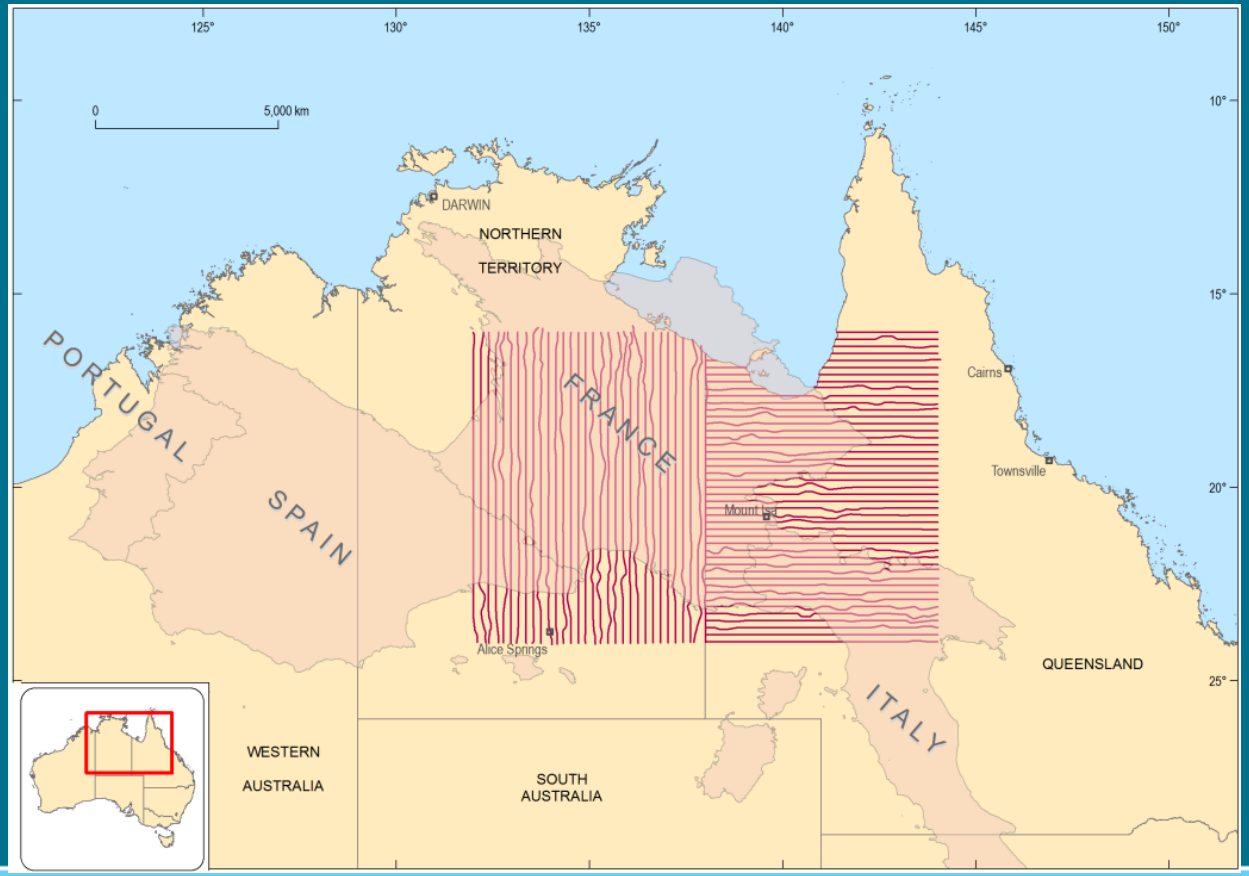


Coompana Stratigraphic Drilling

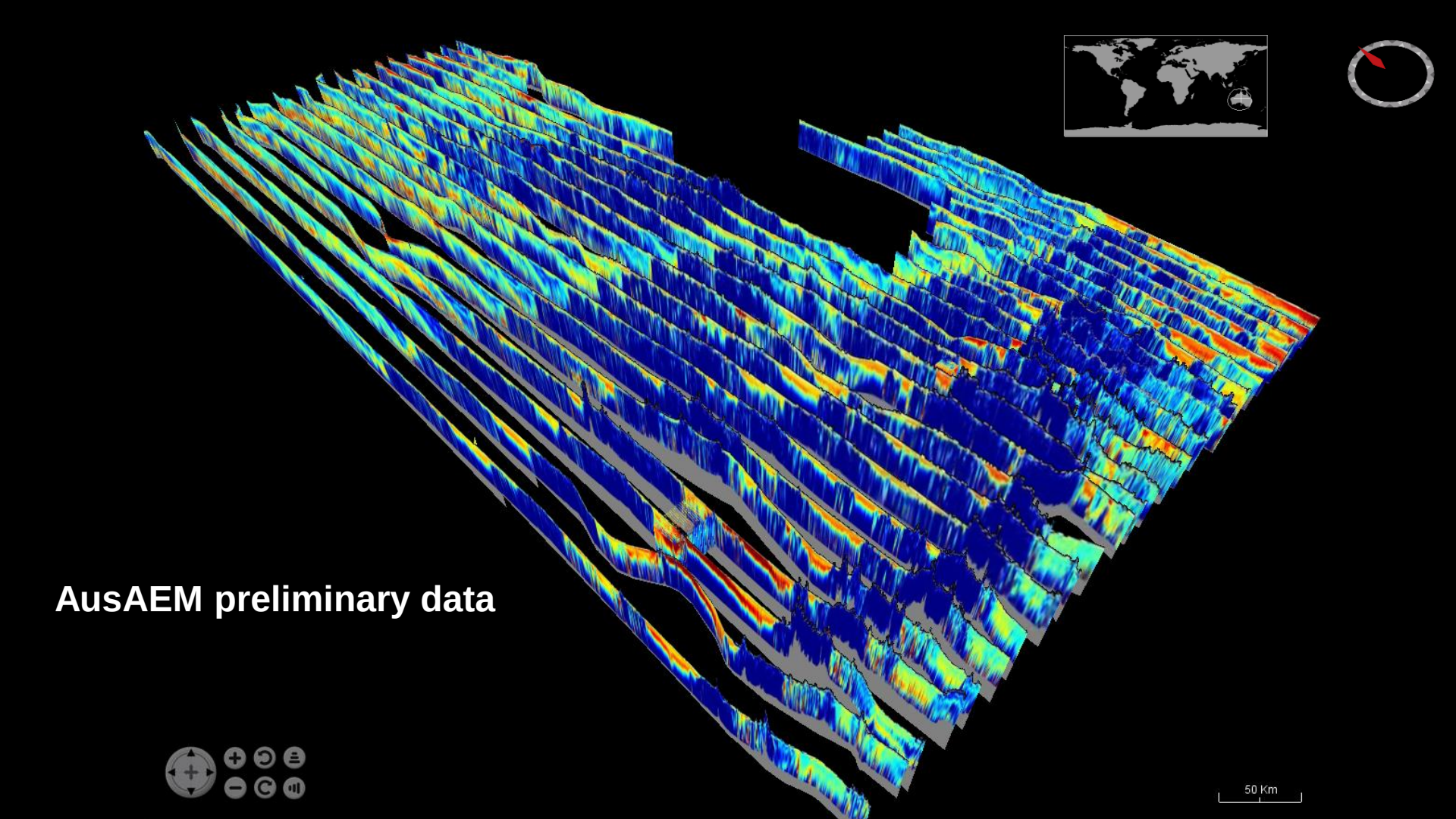
- Led by Geological Survey of South Australia
- No surface outcrop due to extensive Neoproterozoic to Cenozoic cover sediments of the Officer, Denman, Bight and Eucla basins
- New airborne geophysical data acquisition to improve coverage
- Pre-drilling geophysics to assess cover thickness - toolbox
- GSSA compiling new model of geological evolution and metallogeny



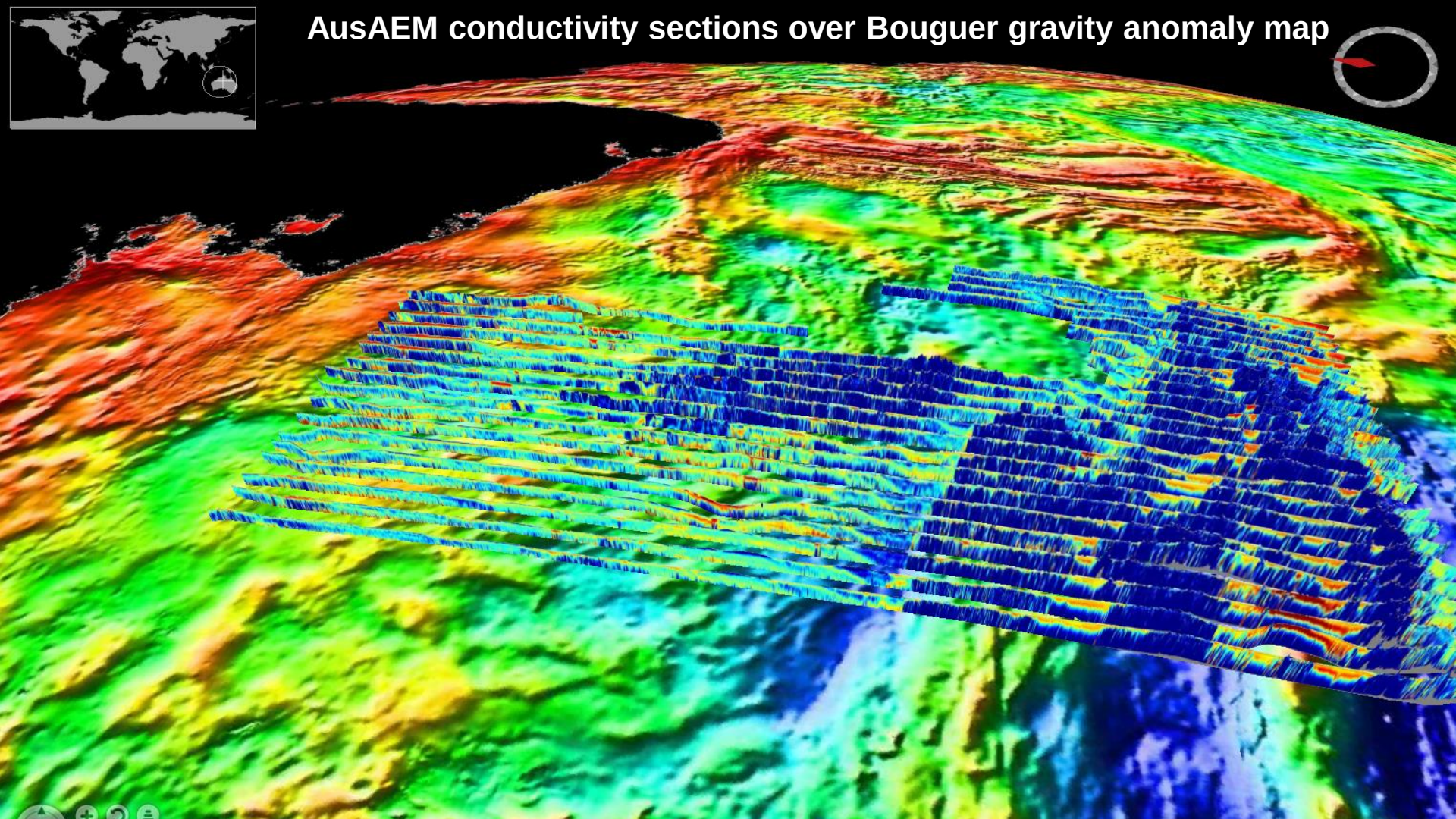
AusAEM: acquisition at an unprecedented scale



- Provide a 20 km-spaced national framework for AEM surveys
- Map:
  - Cover thickness
  - Cover character
  - Hydrogeology
  - Direct detection
- Reduce exploration risk and stimulate investment
- Flight lines up to ~600 km long
- Presently ~50% complete


AusAEM preliminary data
50 Km

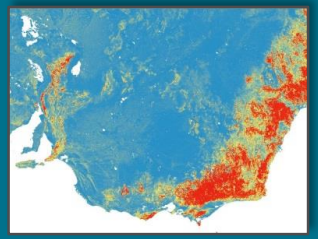
AusAEM conductivity sections over Bouguer gravity anomaly map



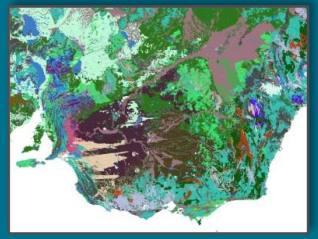
Points to Surfaces – Machine Learning:

e.g. Murray Basin thickness

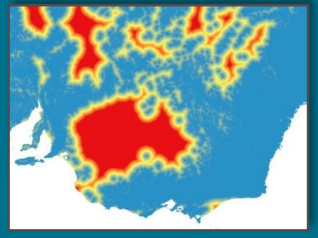
Topo. relief



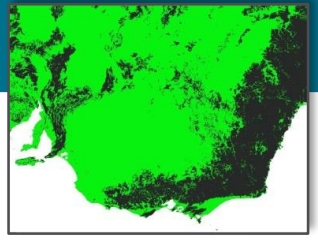
Surface geol.

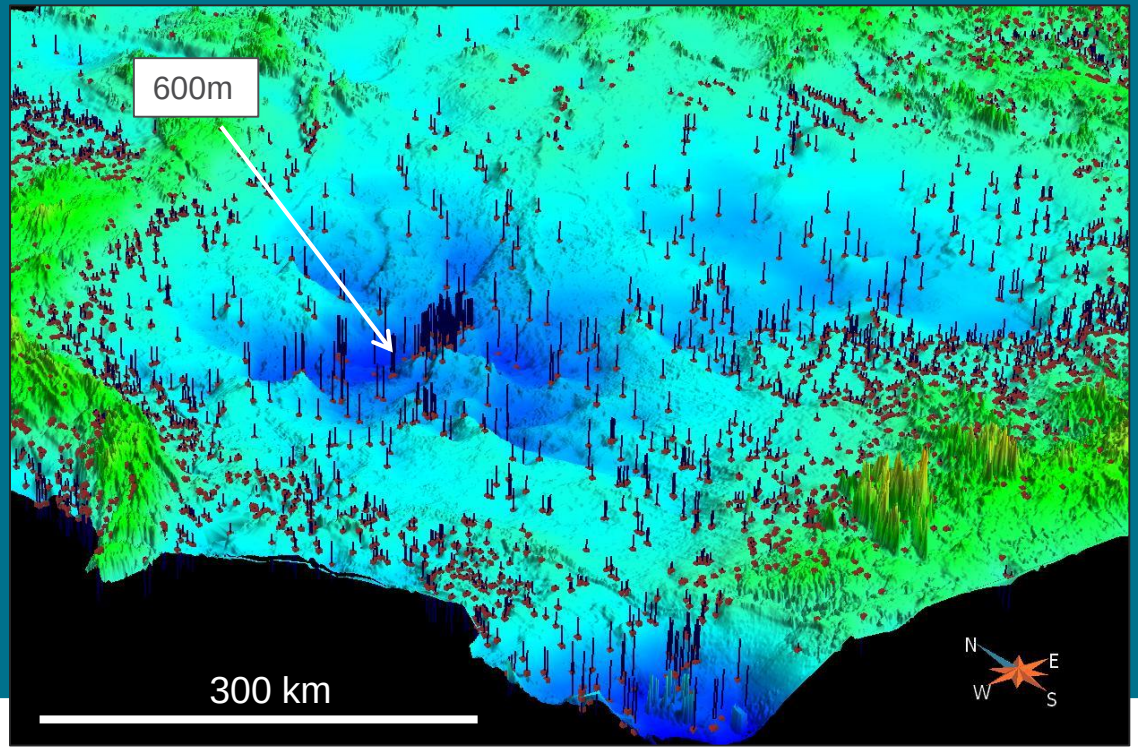


Distance from outcrop

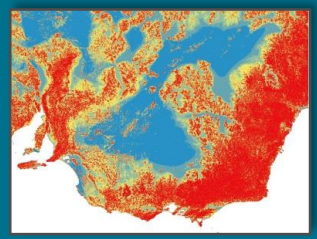


Cenozoic geology

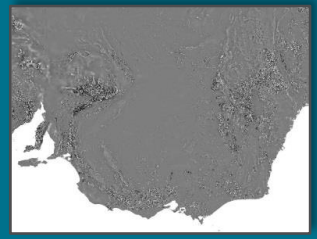




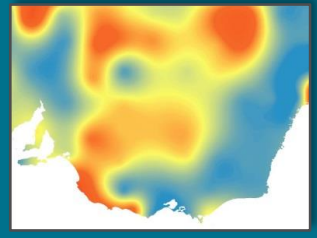
Valley flatness index



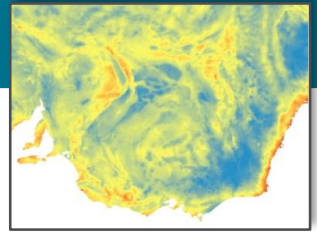
RTP TMI



Filtered tilt est.

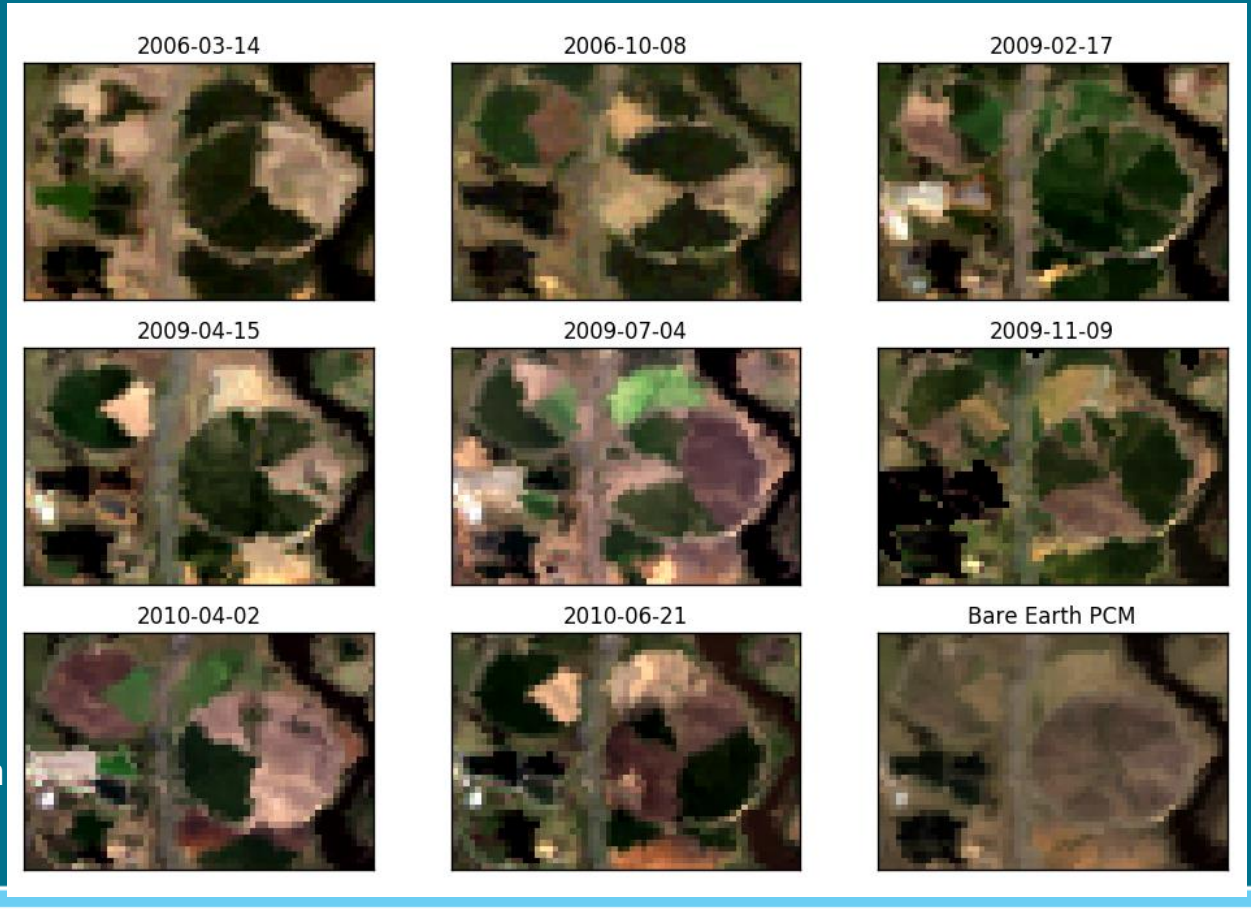


Bouguer gravity



Targets = drill holes, mag estimates, reflection seismic

Better predictors: Bare Earth – Landsat TM



John Wilford in Collaboration with Dale Roberts (ANU)

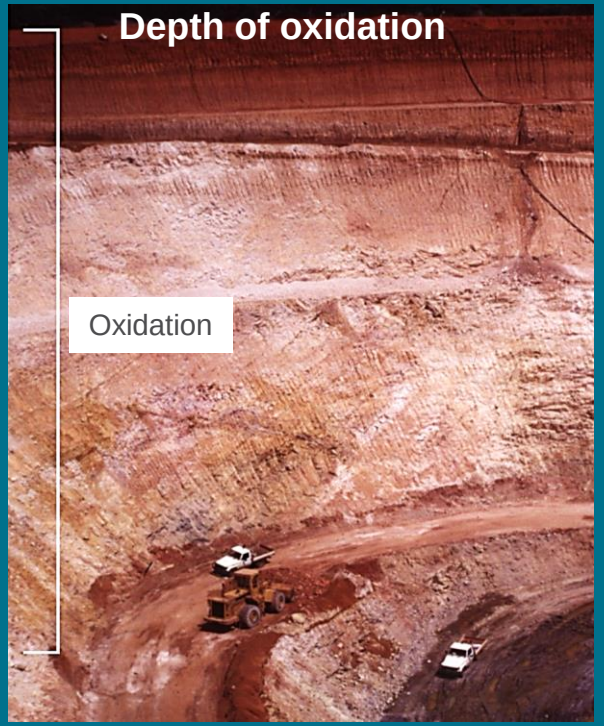
Will result in better maps of e.g. clays and iron oxides

Karol.Czarnota@ga.gov.au

Estimates of Geological and Geophysical Surfaces (EGGS) database: Definition of cover

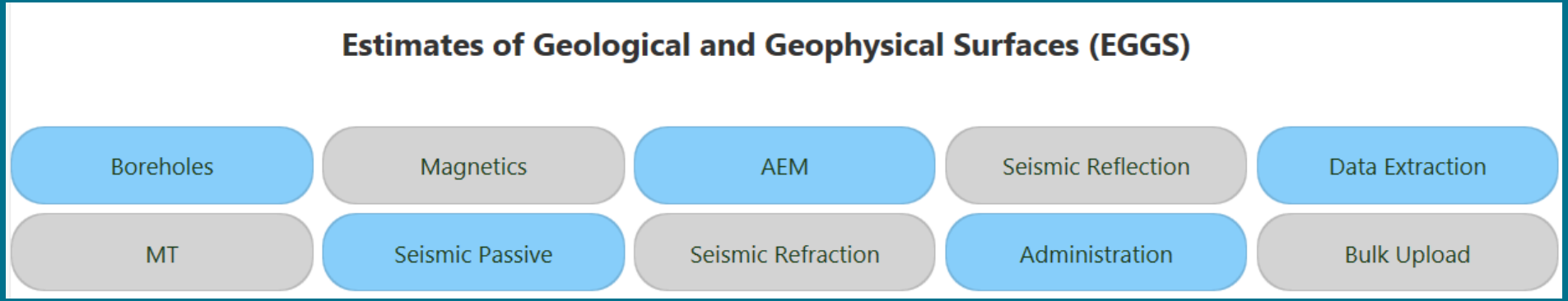
Chronostratigraphic

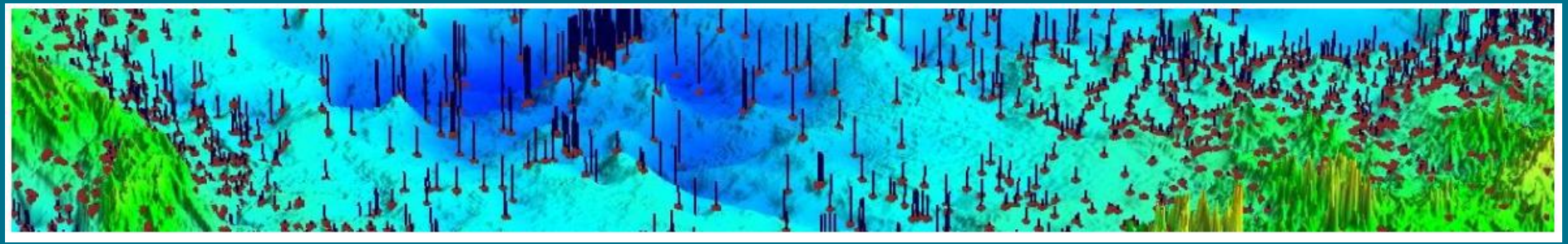
- **Cenozoic**
- **Mesozoic**
- **Paleozoic**
- **Proterozoic (Neoproterozic/ Mesoproterozoic)**
- **Paleoproterozoic/Archean**



Source: Bronzewing open cut (WA). Ravi Anand

EGGS Home page

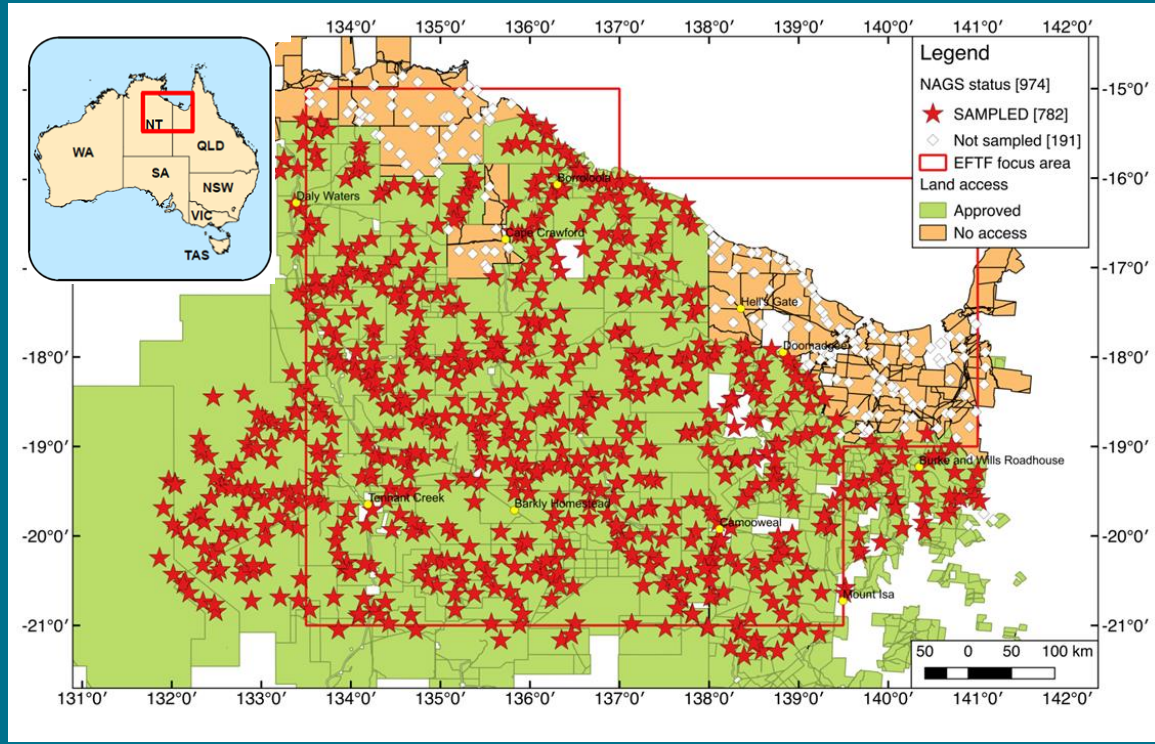




Emma Mathews, Tony Meixner, Yusen Ley Cooper, Malcolm Nicoll

Soil geochemistry for baseline and distal footprints

- 780 samples collected at ~20 km spacing (0–10 cm depth).
- Sample preparation – Centre for Appropriate Technologies in Alice Springs
- Mid-March 2018 data release:
  - Metadata, Ph, EC, Colour
  - MMI
  - Fine fraction full digest



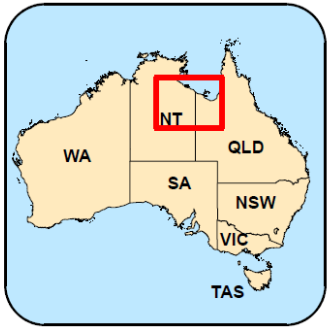
Collaboration with NTGS and GSQ

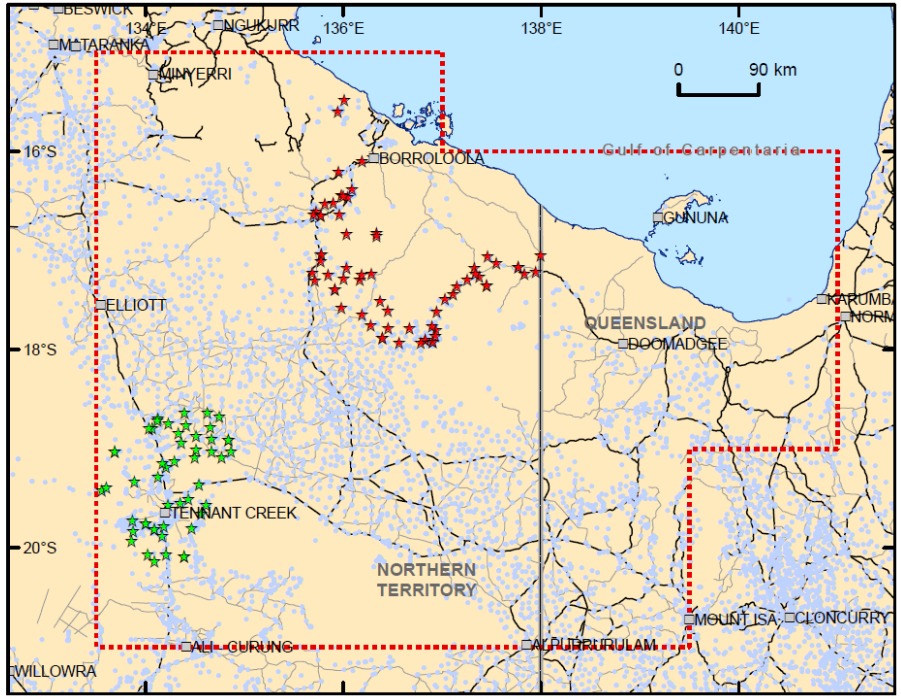
Evgeniy Bastrakov and Phil Main

Hydrogeochemistry for baseline and distal footprints

Sampling water bores for

- Baseline environmental data
- Distal footprints mineral exploration
- 2017 field season (Jun to Oct) - 118 groundwater samples from 106 bores
- Data release mid-2018





Luke Wallace, Ivan Schroder & Patrice deCaritat

Groundwater Regional Case Studies

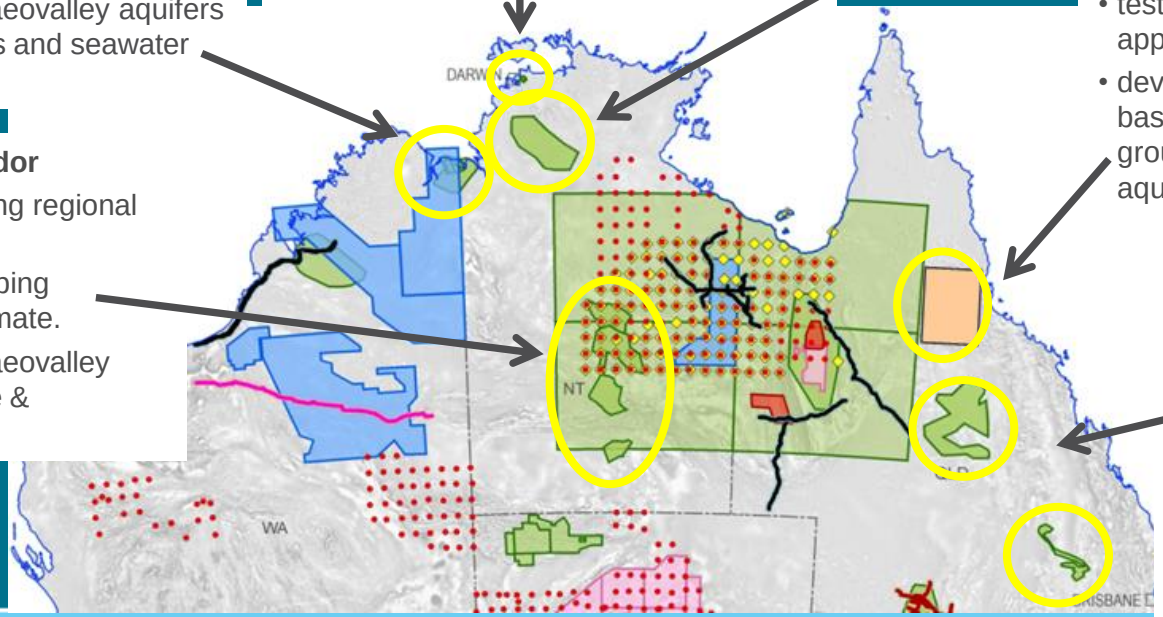
East Kimberley
- build on understanding and infrastructure in Ord region.
- test groundwater mapping approaches in the tropics.
- identify basin and palaeovalley aquifers & map local salt stores and seawater intrusion interface.

Howard East
- inform NT Govt water planning.
- characterise temporal and spatial change in seawater intrusion interface.
- identify preferential pathways/barriers to flow.

Daly River Basin
- inform NT Govt water planning.
- map and characterise structural features.
- assess aquifer compartmentalisation and inter-aquifer connectivity.

Upper Burdekin
- test groundwater mapping approaches in basalt aquifers.
- develop an improved knowledge base of the hydrogeology and groundwater characteristics of the aquifers in basalt provinces.

Southern Stuart Corridor
- frontier area but existing regional infrastructure.
- test groundwater mapping approaches in arid climate.
- identify basin and palaeovalley aquifers for agriculture & communities.



Surat-Galilee
- assess the potential for alternative, cost-effective direct approaches to map faults.
- interpret aquifer hydrodynamics and structural compartmentalisation of sedimentary basins.

Geoscience tools for mapping groundwater

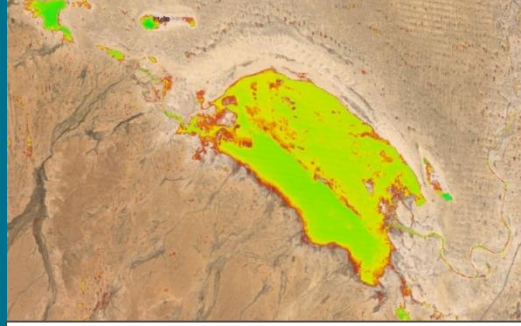
Regional data:

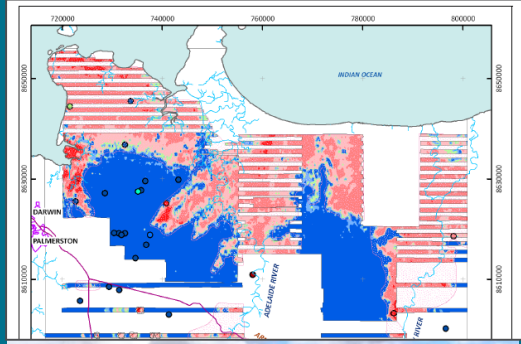
- Remote Sensing = regolith, surface water, vegetation, time → predictive.
- Elevation & Geomorphic mapping = topography, riverbed dynamics, neotectonics.
- Airborne electromagnetics = geology, faults, groundwater.

Point data:

- Ground magnetic resonance & aquifer pump & slug tests = porosity, permeability, transmissivity.
- Borehole geophysics = rock properties.
- Sample/water collection = chemistry, mineralogy, age +

→ ***Rapid, quantitative & cost-effective mapping, characterisation & modelling of groundwater systems***





MinEx CRC

Commencing 1 July 2018:

- 10-year CRC devoted to effective, safe, environmentally friendly drilling technology.
- $50 million from the Australian Government to lever >$150 m from Geoscience Australia, industry, universities, state & territory geological surveys

Theme 3 - National Drilling Initiative (NDI):

- A collaborative drilling program between Geoscience Australia, geological surveys of NSW, SA and WA (and possibly GSQ, GSV, NTGS and MRT)
- Reducing risk for mineral exploration under cover

The MinEx CRC's current participants are: Anglo American, Barrick Gold, BHP, South32, Atlas Copco, Geotec Boyles, HiSeis, Imdex, LKAB Wassara, McKay, Olympus, Sandvik, Geoscience Australia, Geological Surveys of NSW, SA and WA, Curtin University, Universities of Adelaide, Newcastle, South Australia and Western Australia, MRIWA and CSIRO.

Current MinEx CRC Affiliates are Investigator, Minotaur, DataCode, Minalyze, Mudlogic, Southern Geoscience, Geological Surveys of NT, Queensland and Victoria, Mineral Resources Tasmania and the SA Department of State Development.

Australian Government
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Thank you

More information on the EFTF webpage: www.ga.gov.au/eftf

MinEx CRC webpage: **www.minexcrc.com.au**

Phone: +61 2 6249 9111

Web: www.ga.gov.au

Email: clientservices@ga.gov.au

Address: Cnr Jerrabomberra Avenue and Hindmarsh Drive, Symonston ACT 2609

Postal Address: GPO Box 378, Canberra ACT 2601