

**make
history.**



GeoEnergy research and teaching

**Roundtable for Energy Resources
October 2023**

We acknowledge and pay our respects to the Kurna people,
the traditional custodians whose ancestral lands we gather on.

We acknowledge the deep feelings of attachment and relationship of the
Kurna people to country and we respect and value their past, present
and ongoing connection to the land and cultural beliefs.

GeoEnergy Resources Expertise at The University of Adelaide

#7 in the world, Petroleum Engineering (QS2023)

Top 100 for Geosciences, and Energy and Fuels (USNews2023; QS2023; Shanghai2023)

Then: Geology and Geophysics, to NCPGG and SPE, to ASP then ASPER

Now:

- Engineering – School of Chemical Engineering, Discipline of Mining and Petroleum Engineering
- Geoscience – School of Physics, Chemistry and Earth Sciences, Discipline of Earth Sciences

Institute for Sustainability, Energy and Resources

The University of Adelaide is committed to providing sustainable and socially responsible solutions that benefit our ecosystems, governments, industries and communities.

Director of ISER and Pro Vice-Chancellor (Energy Futures):
Professor Michael Goodsite

Degree programs

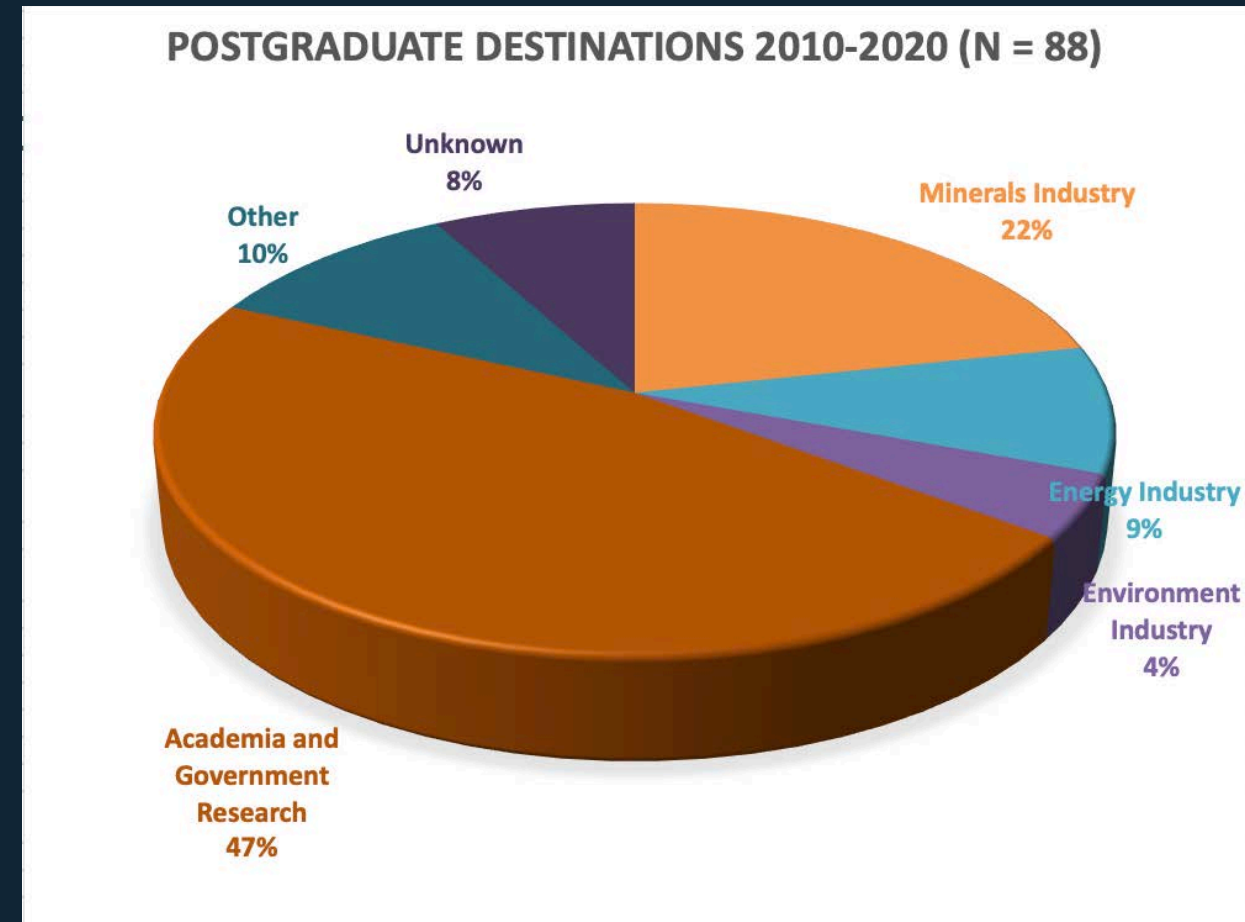
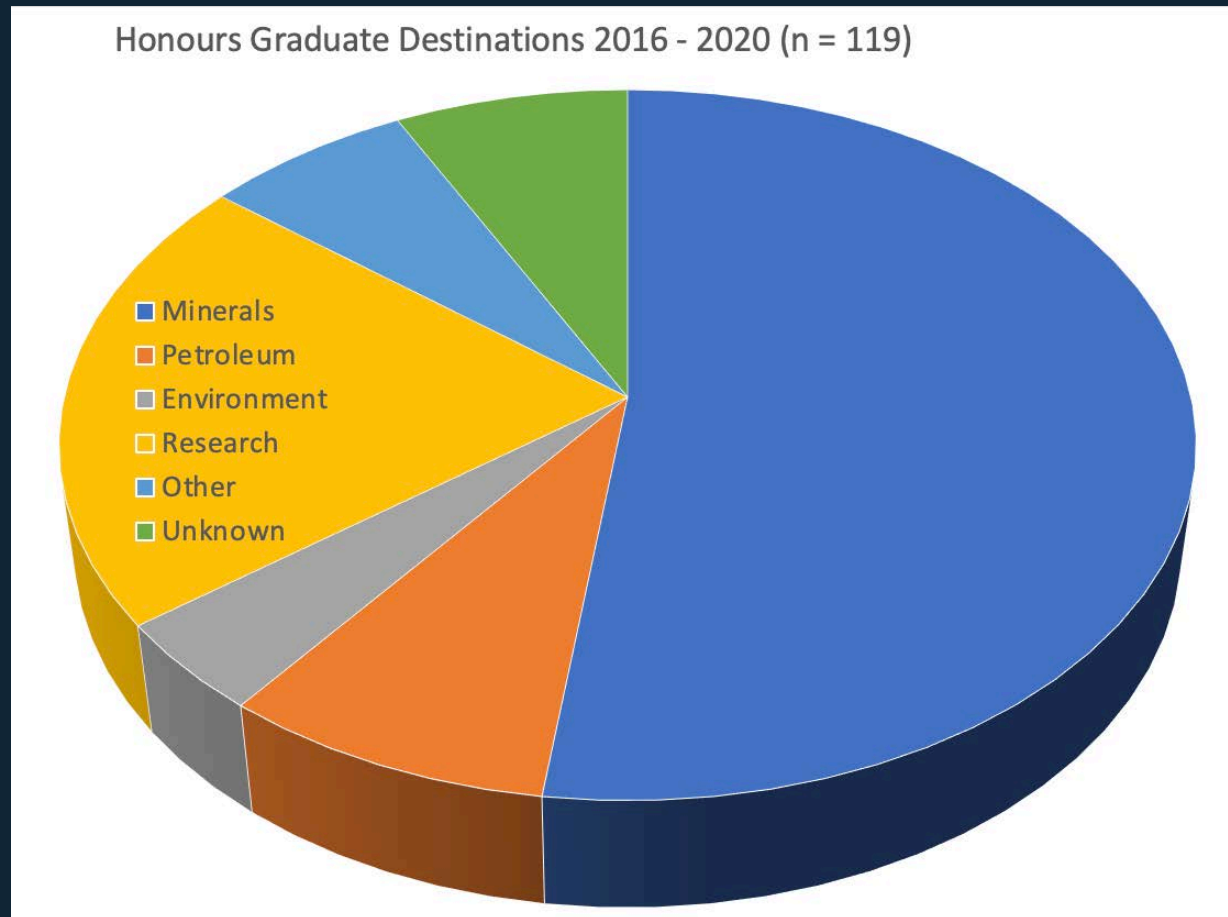
- B.Eng (Hons)(Petroleum Engineering)
- Master of Petroleum Engineering (conversion Masters)
- BSc (Majors in Geology, Geophysics, Palaeontology, Earth Resources)
- BSc (Hons) Energy Geoscience
 - Structure now aligned with other Earth Sciences Hons programs, opportunity for sponsored projects and internships remains.

New undergraduate courses 2022-2023

- In the B.Eng(PetroEng) – Carbon Capture and Storage
- In the BSc(Geology) – Energy Resources
- New Major in Earth Resources for the BSc



Earth Sciences Graduate Destinations



More than 40 major companies, government and research institutes

2023:

6 Hons GeoEnergy projects 2023 across engineering and earth sciences

~15 GeoEnergy PhD students across engineering and earth sciences at present

New GeoEnergy & Storage Laboratory Facilities

CCS coreflooding system

Funded by Chevron \$2.5M for facility and staff

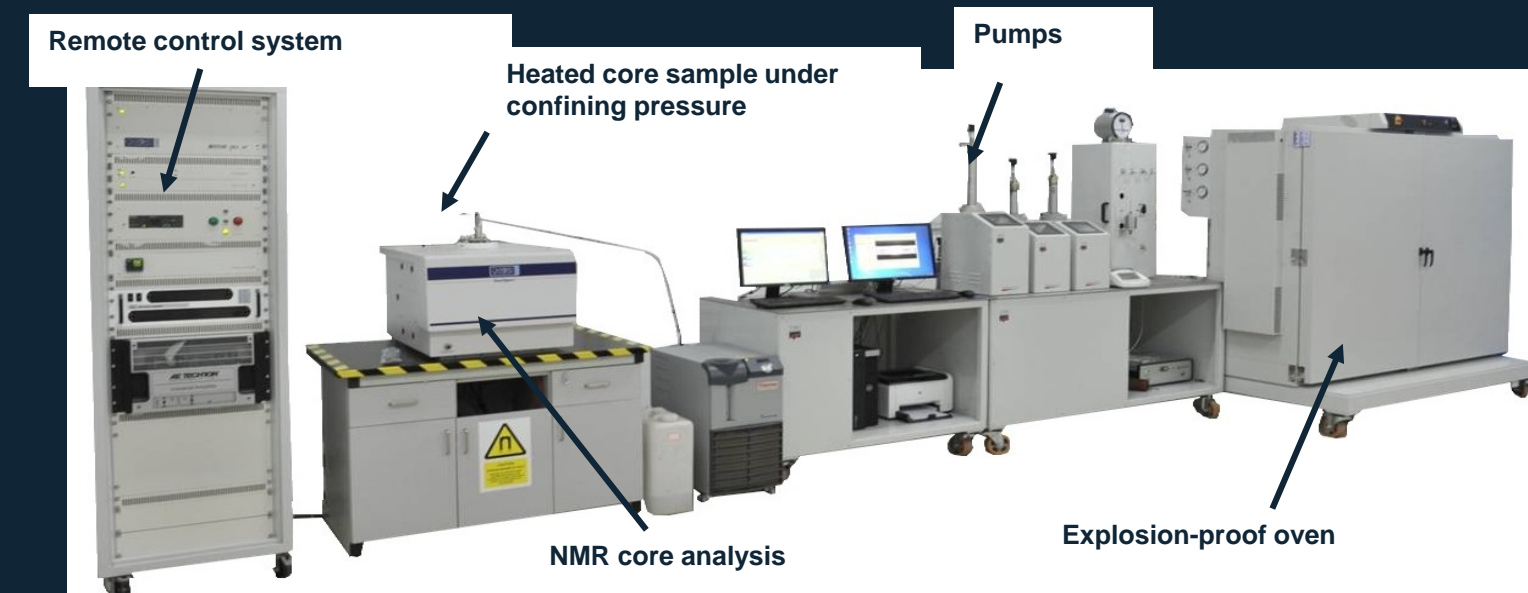
- 10,000 psi , 150 C
- 1m long core
- Linear X-ray scanner
- Acoustic separator
- SS and USS tests



Integrated facility for UHS

Funded through ARC LIEF grant, with partners including DEM, Beach Energy and partner Universities \$2.9M

- Hydrogen safe laboratory
- Hydrogen-compatible coreflood (H₂, CO₂, oil, natural gas)
 - NMR core analyser with 3D capabilities
 - 5000 psi pressure, 150C temperature
- High-pressure contact angle measurement
- Batch reactor

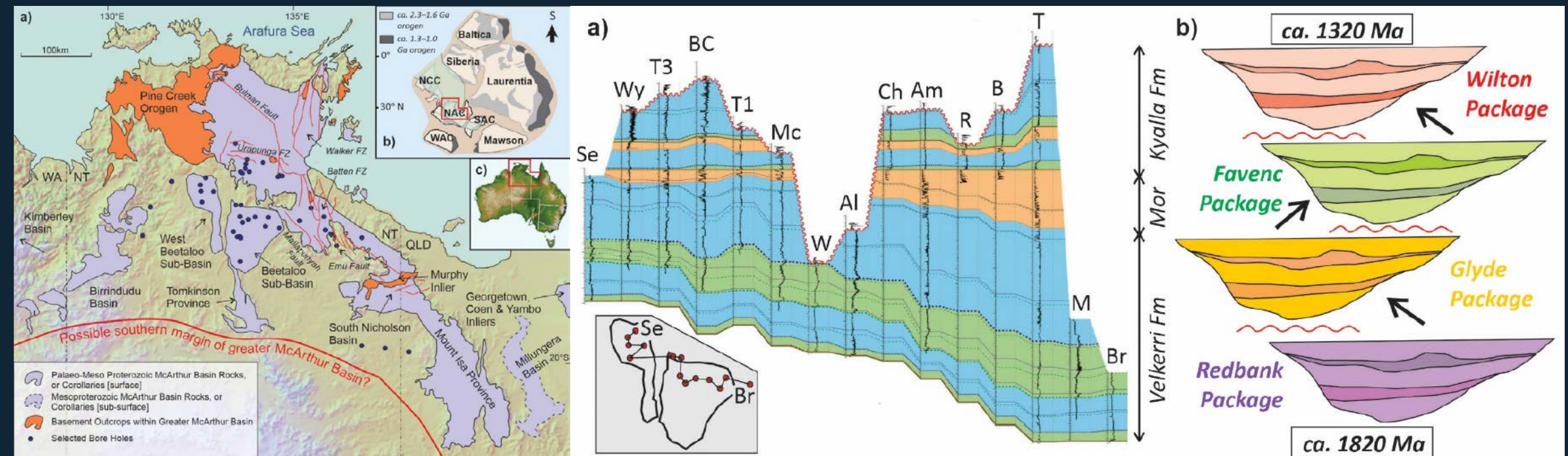


ARC Linkage Project 2021-2024 \$536,198

Reconstructing the Beetaloo/Greater McArthur Basin System

Partners: NTGS, CSIRO, Santos, Empire Energy, Teck, BHP, University of Copenhagen

Prof. Alan Collins; Prof. Simon Holford; Dr Juraj Farkas; Dr Claudio Delle Piane; A/Prof. Carl Spandler; Dr Vincent Crombez; A/Prof. Rosalind King; Dr Amber Jarrett; Prof. Robert Frei



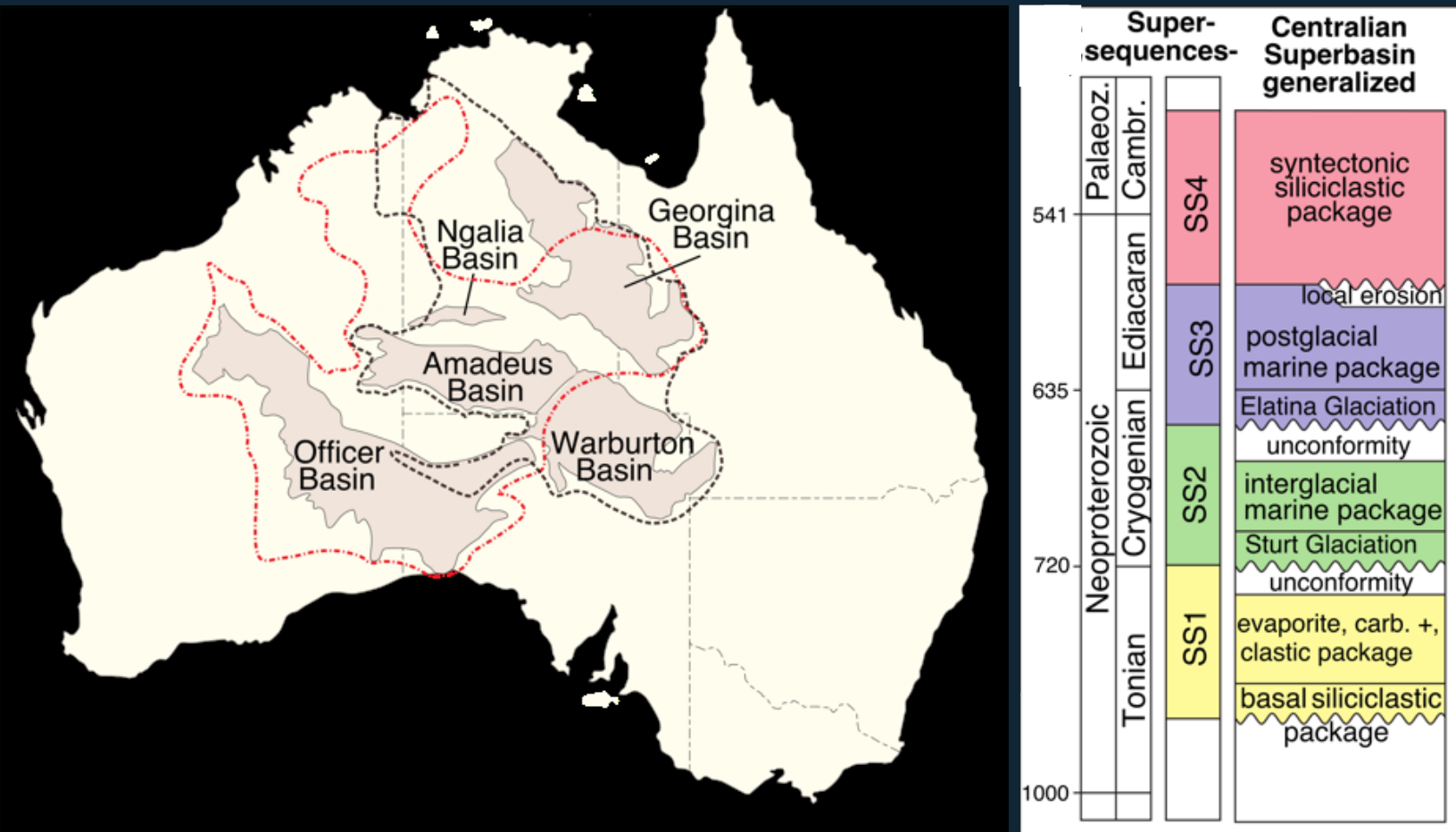
A stratigraphic and water chemistry framework for the greater McArthur Basin for researchers and explorers - lithostratigraphic, chronostratigraphic and chemostratigraphic.

ARC Linkage Project 2022-2024 \$405,000

Novel isotope techniques to explore the Centralian Superbasin.

Partners: NTGS, GSWA, DEM, Agilent Technologies, IsotopX

Investigators: Dr Juraj Farkas; Prof. Alan Collins; A/Prof. Stijn Glorie; Dr Sarah Gilbert; Dr Morgan Blades; Dr Peter Haines



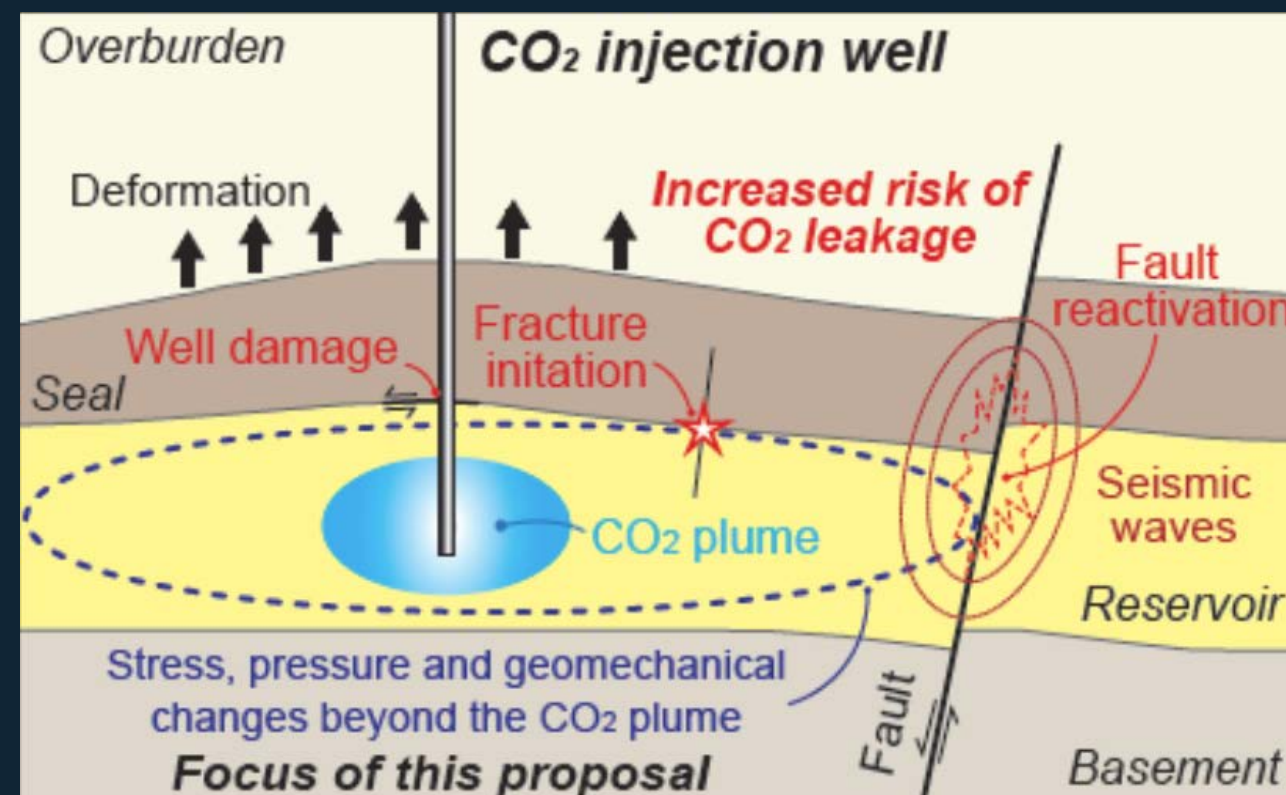
De-risking exploration of the Centralian Superbasin by constraining absolute ages and depositional setting of sedimentary sequences using novel geochronological and isotopic tools developed by the CIs.

ARC Linkage Project 2024-2026 \$506,554

Multiscale geomechanical modelling of basin-scale CO₂ storage.

Partners: Department for Energy and Mining, Tech Limit, Beach Energy, Santos, Geoscience Australia, University of Queensland

Investigators: Prof. Simon Holford; Dr Mojtaba Rajabi; A/Prof. Rosalind King; Adj/Prof. Ken McClay; Dr Khalid Amrouch; Dr Alireza Salmachi; Dr Mark Bunch; Dr Scott Mildren; Dr Betina Bendall; Ms Carrie Trembath



Enabling rapid assessments of potential for reservoir deformation due to CO₂ injection in data-poor basins

CRC-P Round 14 \$863,000

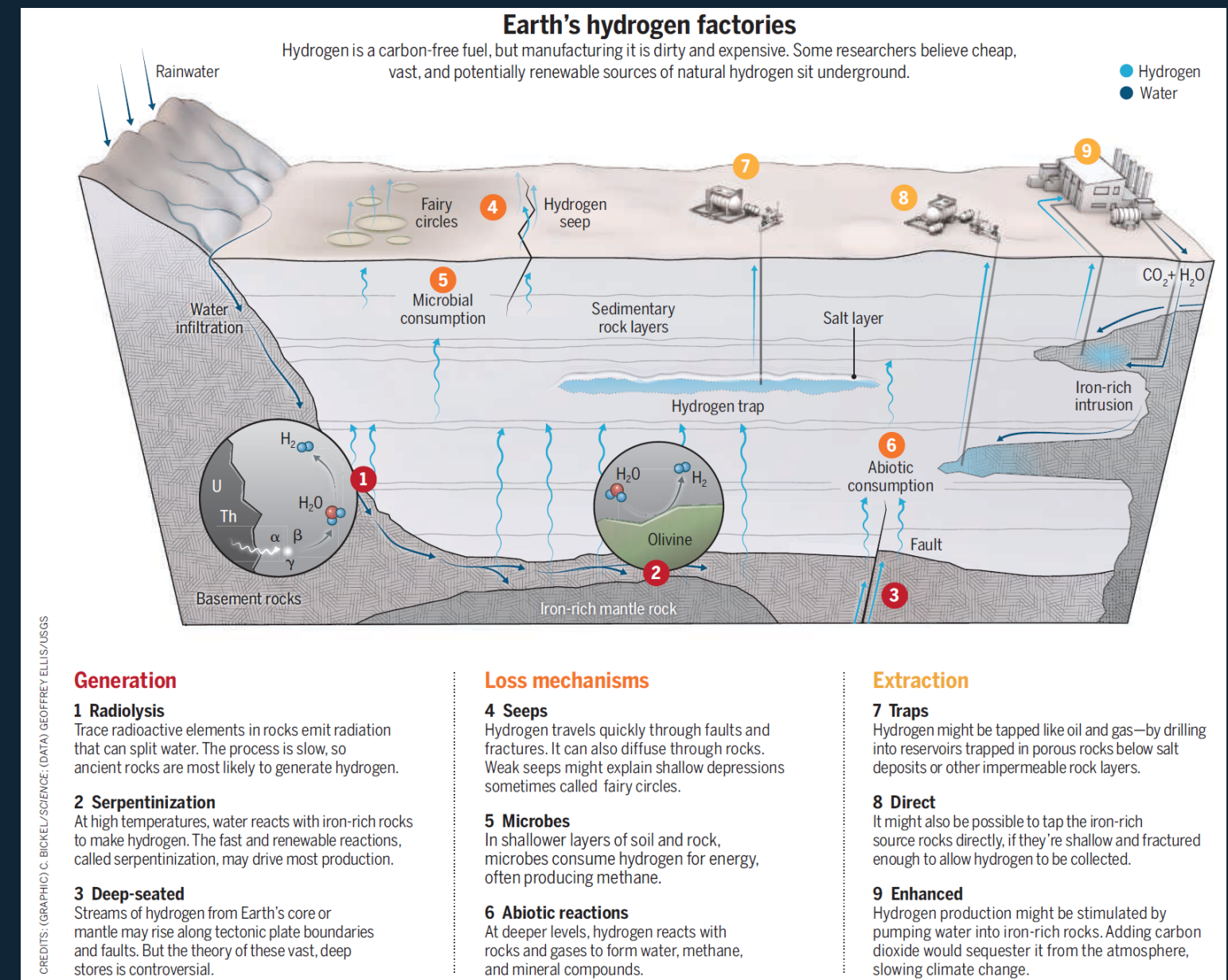
Accelerating exploration & extraction of renewable natural hydrogen.

Awarded to H2EX Pty Ltd,

Partners: Black & Veatch Australia Pty Ltd,
University of Adelaide, ANU

UoA Investigators: Prof. Graham Heinson,
Prof. Simon Holford, A/Prof. Rosalind King

Developing a new framework for geophysical and geological exploration, and establishing a new protocol for potential production



<https://www.science.org/content/article/hidden-hydrogen-earth-may-hold-vast-stores-renewable-carbon-free-fuel>

Petronas

Wellbore modelling for CO₂ injection.

A/Prof. Abbas Zeinijahromi, Prof. Pavel Bedrikovetsky,
Dr Thomas Russell

Laboratory-based predictive mathematical modelling of fines migration for optimisation of CO₂ injection.

Shell

Joule-Thomson cooling causing geomechanical reservoir change & hydrate formation.

Prof. Pavel Bedrikovetsky, A/Prof. Abbas Zeinijahromi

Predicting seal-capacity breach and near-well micro-fracturing due to Joule-Thomson cooling and rock strength decrease. Deriving model for well skin factor during hydrate formation and icing.

Scaling Green Hydrogen CRC



- University of Adelaide is leading the bid.
- Aims to become the largest single initiative in the country focused on supporting the scaling up of the green hydrogen sector. **97** partners across Australia.
- Professor Christian Doonan is the Research Director.
- **\$200M** over 10 years cash and in-kind.

<https://hydrogencrc.com.au/>

1. Production & Storage



2. Water



3. Chemicals



4. Mobility



5. Enabling



ARENA full proposal, awaiting outcome:

- **Safe and Optimised Underground Hydrogen Storage and Monitoring Project Plan**

UNSW, UoA, QUT, CO2CRC, inGauge Energy, Fender Geophysics, EXIGE, SoluForce

Accelerate commercialisation of renewable hydrogen by reducing barriers to entry for companies considering large scale storage of hydrogen.

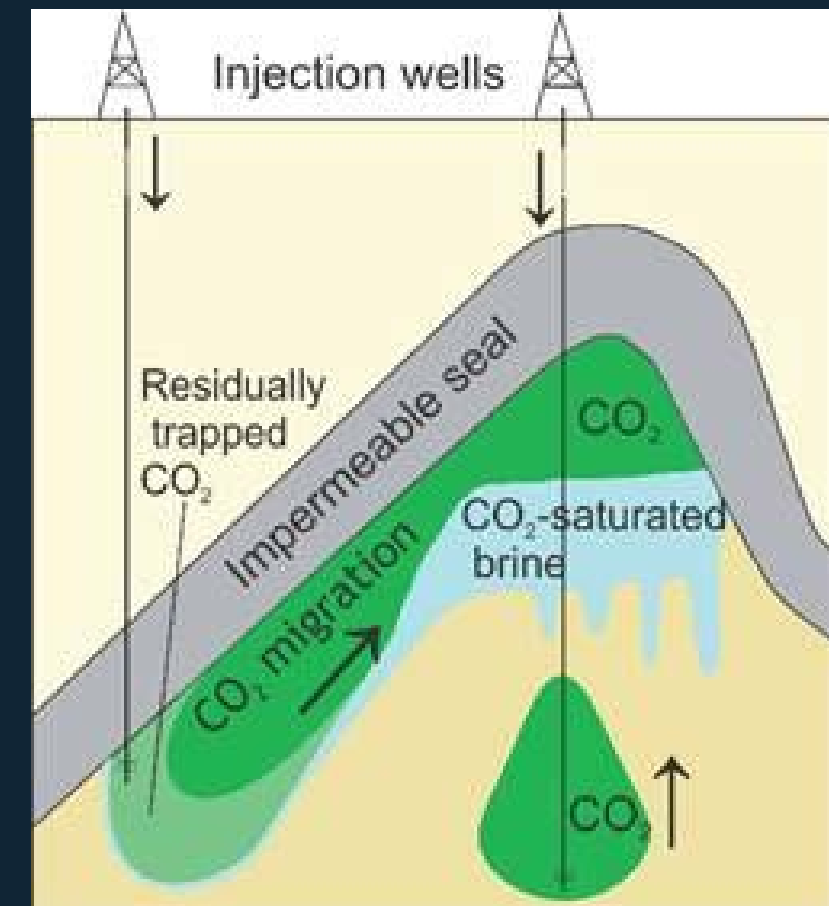
ARC Linkage Submission Dec 2023

Multiscale physics for well-reservoir prediction during CO₂ storage

Prof. Bedrikovetsky, A/Prof Zeinijahromi, Prof. Keshavarz (ECU), Prof Hussain (UNSW)

Partners: DEM, Santos

Predicting behaviour of injection wells and reservoirs, through integrated laboratory studies with analytical modelling and numerical simulation.



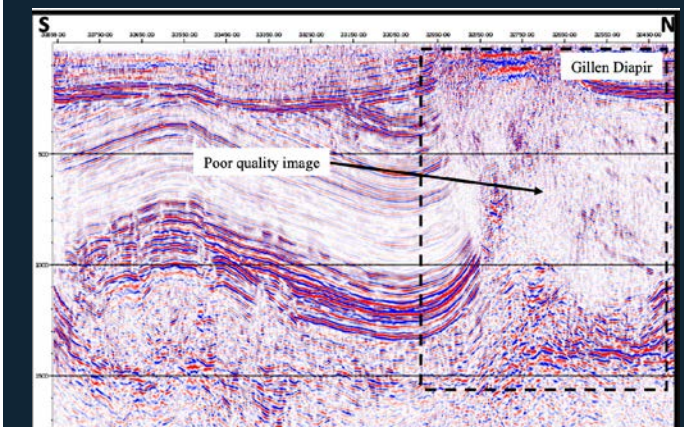
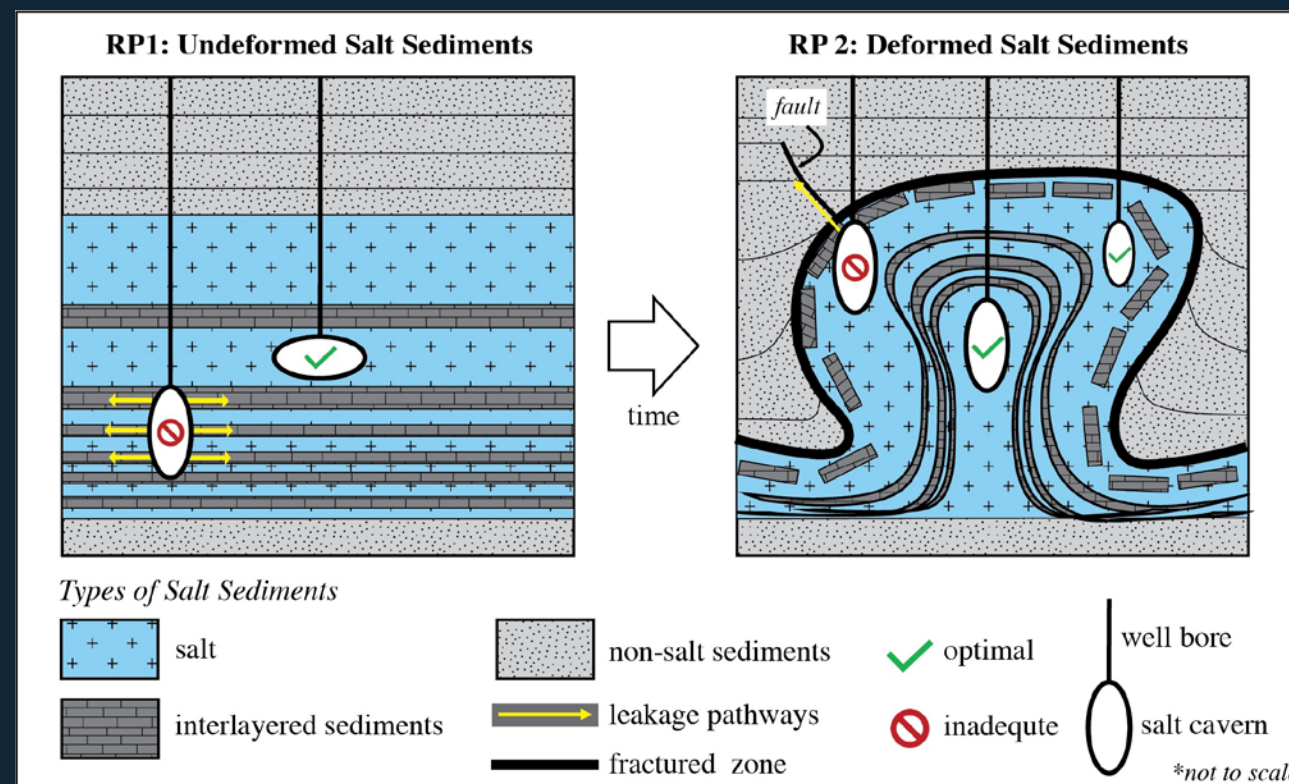
ARC Early Career Industry Fellowship – Dr Rachelle Kernen

Submission Oct 2023

Unlocking Australia's hydrogen industry through large-scale geological storage in salt caverns.

Partners – DEM, NTGS, Woodside Energy, CSIRO

Characterising heterogeneities within bedded salt, incorporating sedimentology and structural geology to better understand potential leakage pathways



Industry and Government engagement

- Evolving membership of School and University advisory boards
- Rather than a formal Advisory Board, likely stakeholder workshops for focused GeoEnergy research, teaching and training input
- Tailored discussions around potential collaborations welcomed

Kathryn Amos
Abbas Zeinijahromi
ISER

kathryn.amos@adelaide.edu.au
abbas.zeinijahromi@adelaide.edu.au
iser@adelaide.edu.au

Simon Holford
SA State Chair Petroleum Geoscience

simon.holford@adelaide.edu.au



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