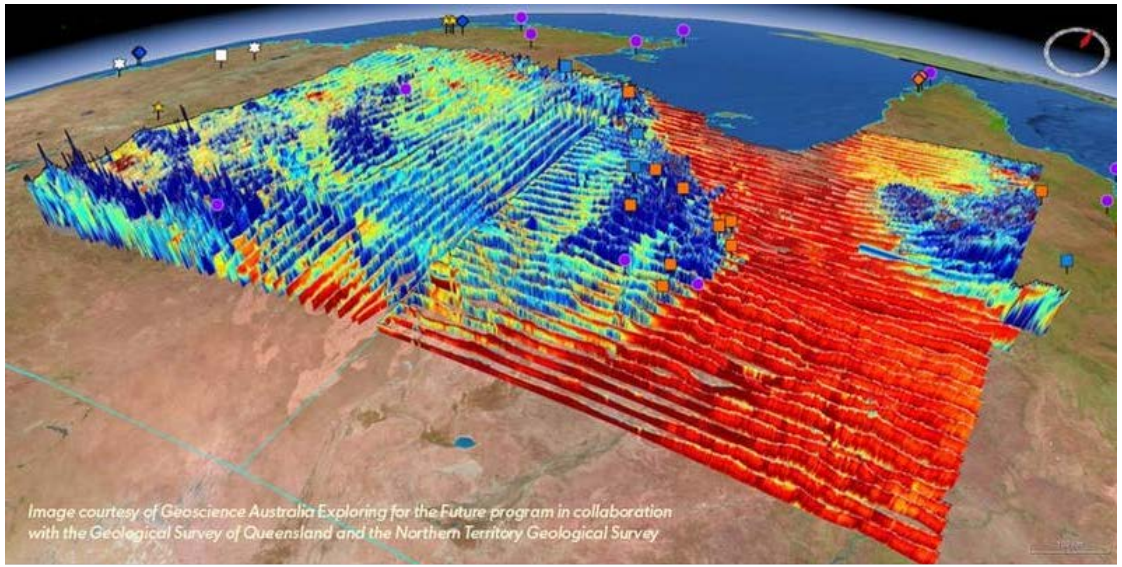
Science in the Surveys 2019

Tuesday 26 March 2019



Session Four

Chair: ***Paul Dale***

3:30 MinEx CRC - a collaboration between surveys, industry and research organisations
Andrew Bailey, *MinEx CRC*

3:55 Australia's decadal plan for geoscience and what it means for industry
Steve Beresford, *Independence Group*

4:20 Supporting Australian exploration industry research impact through AuScope investment in the downward looking telescope
Tim Rawling, *AuScope*

4:45 **Panel discussion**

5:15 **Close**

5:30 **Bus departs for Exploration Managers Conference (Rothbury)**

MinEx CRC Overview

Andrew Bailey
Chief Executive Officer
MinEx CRC

A future for exploration or mining?

Apple promises to stop mining the earth, build all products from recycled materials (April, 2017)

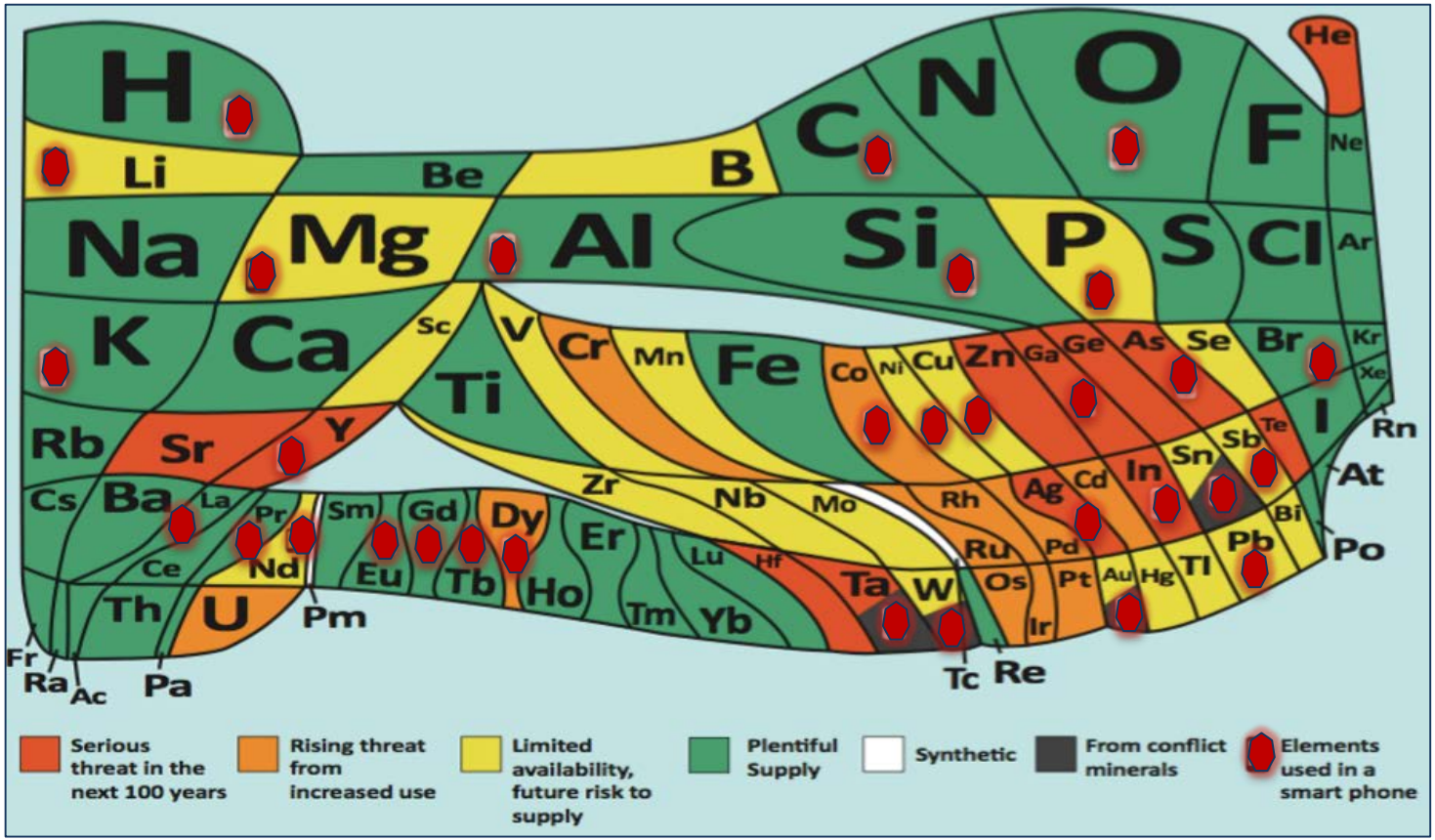
Source: Apple

A future for exploration or mining?

- There is about 340g/t gold in phones
- Can process 1.2 million units pa, but with 1 billion iPhones made to date

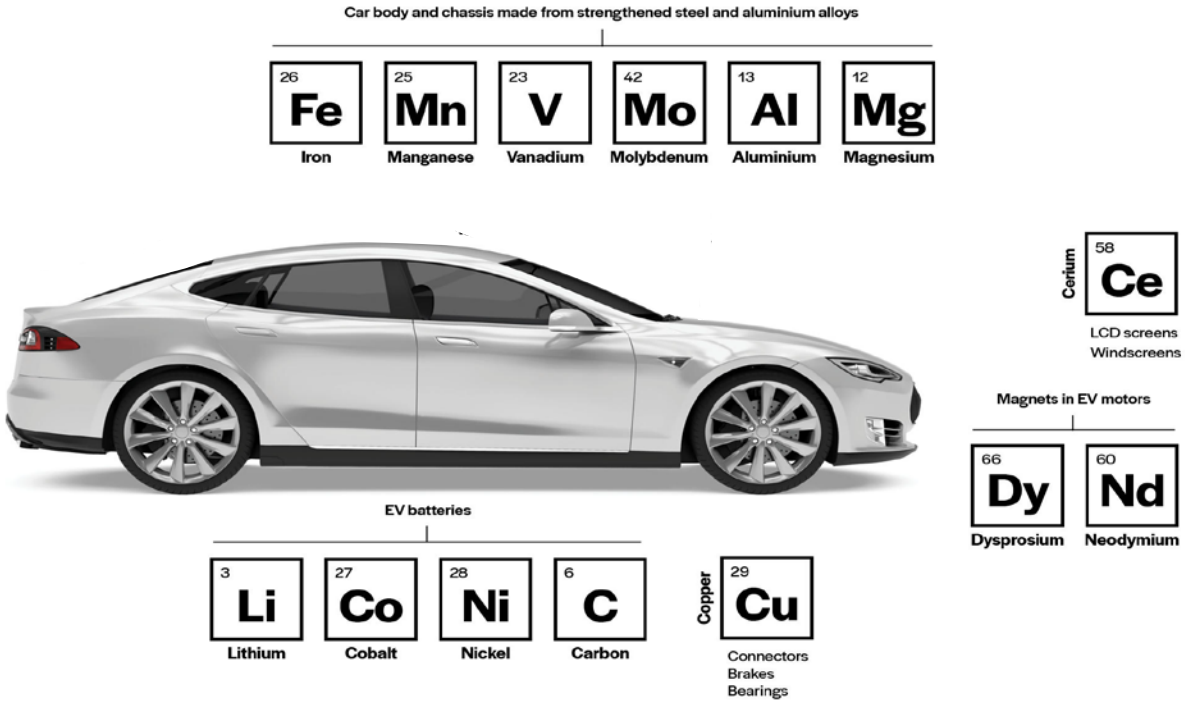
Source: Apple

It’s not as simple as that…



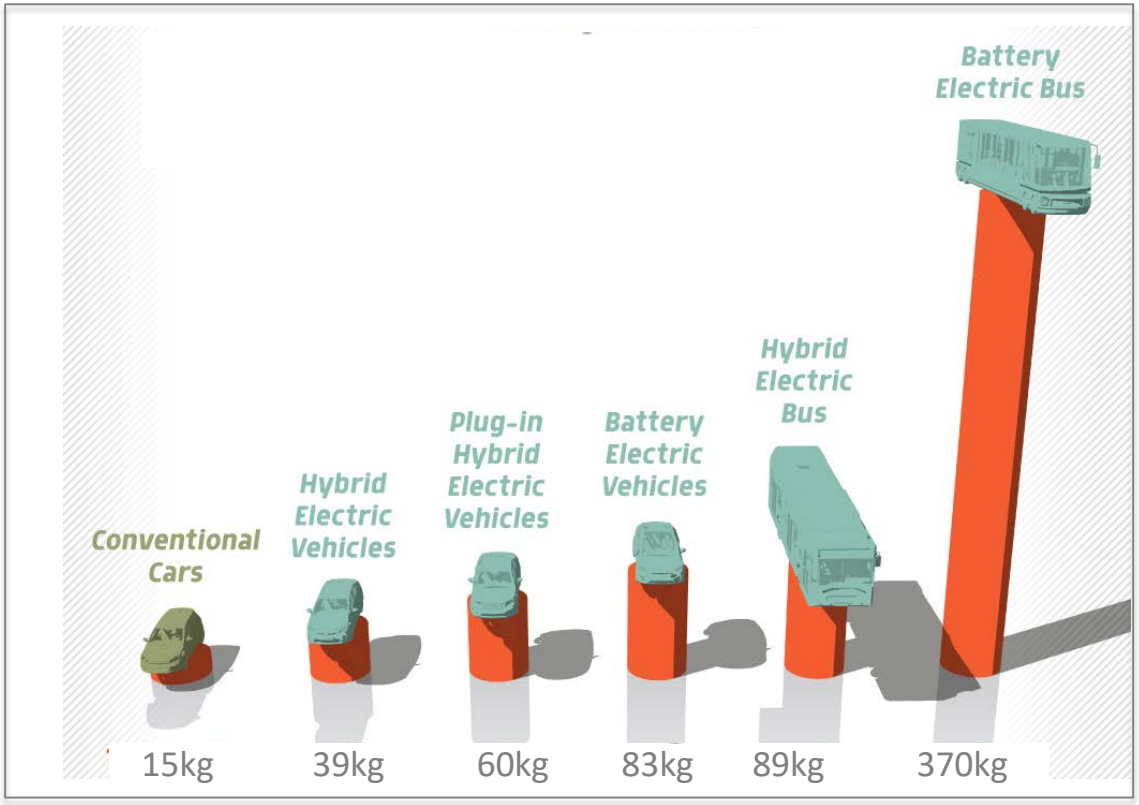
Source: UNESCO and European Chemical Society

Electric Cars: more complicated



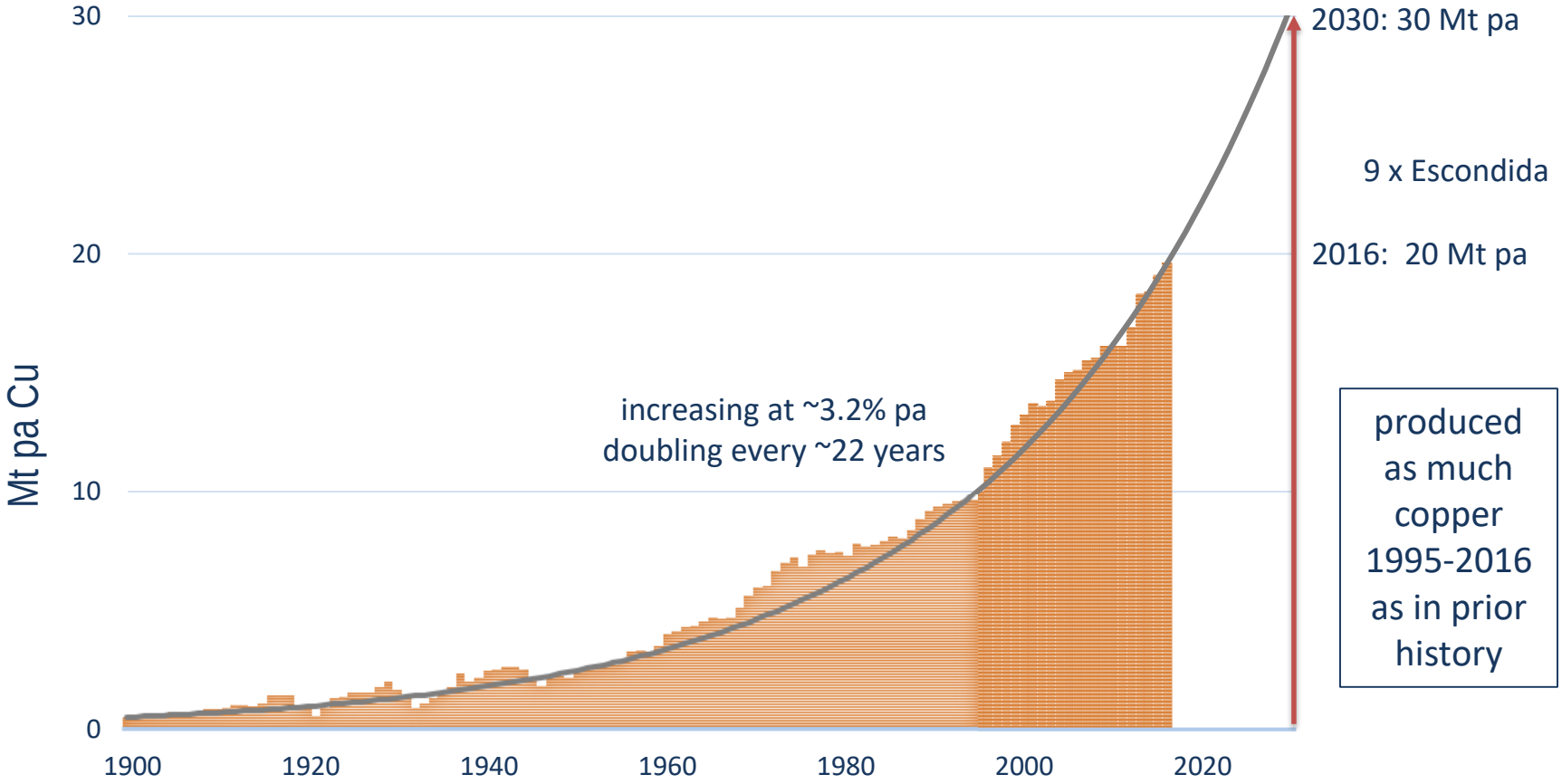
Source: Minerals Council of Australia, Australian Mining, 30 Things

Copper in Electric Vehicles



Source: Copper.org

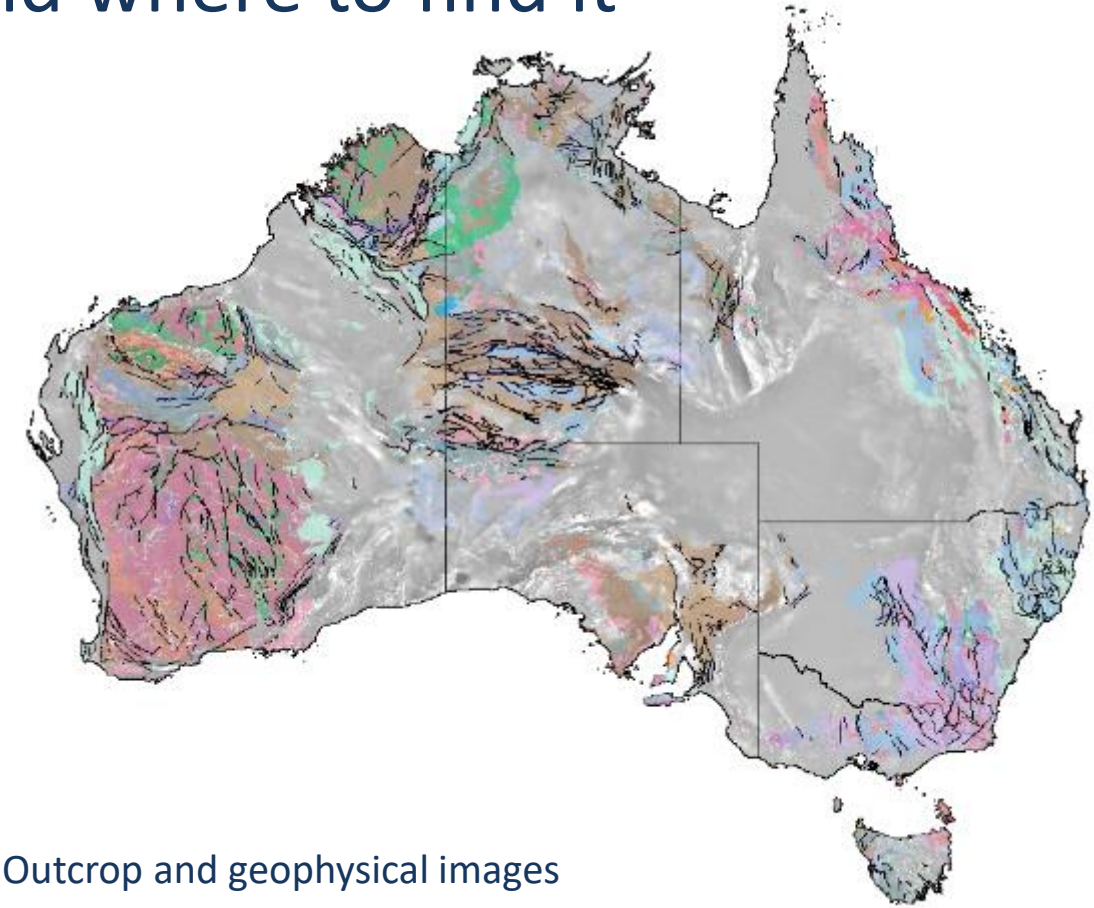
Global Cu Production



Source: US Geological Survey (1900-2016)

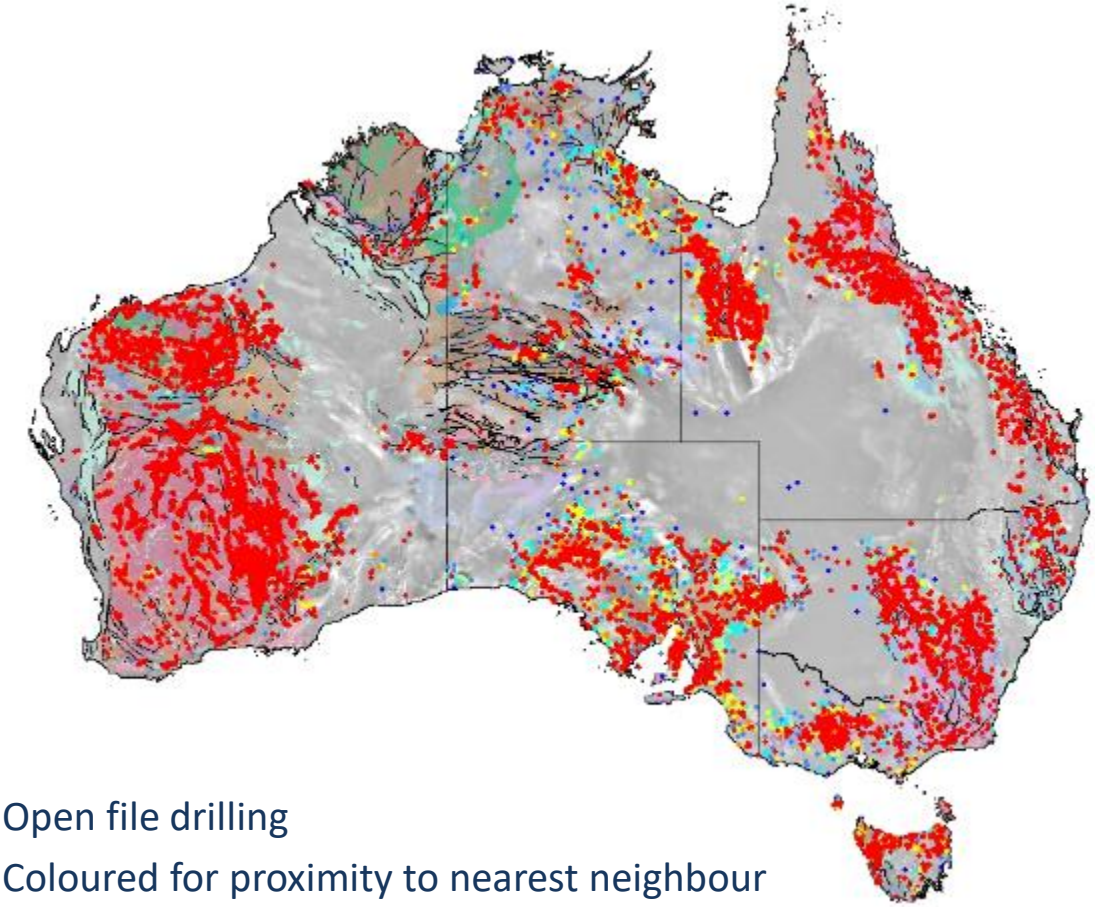
..and where to find it

Prospective rocks continue under cover



Outcrop and geophysical images

We have only explored the exposed provinces



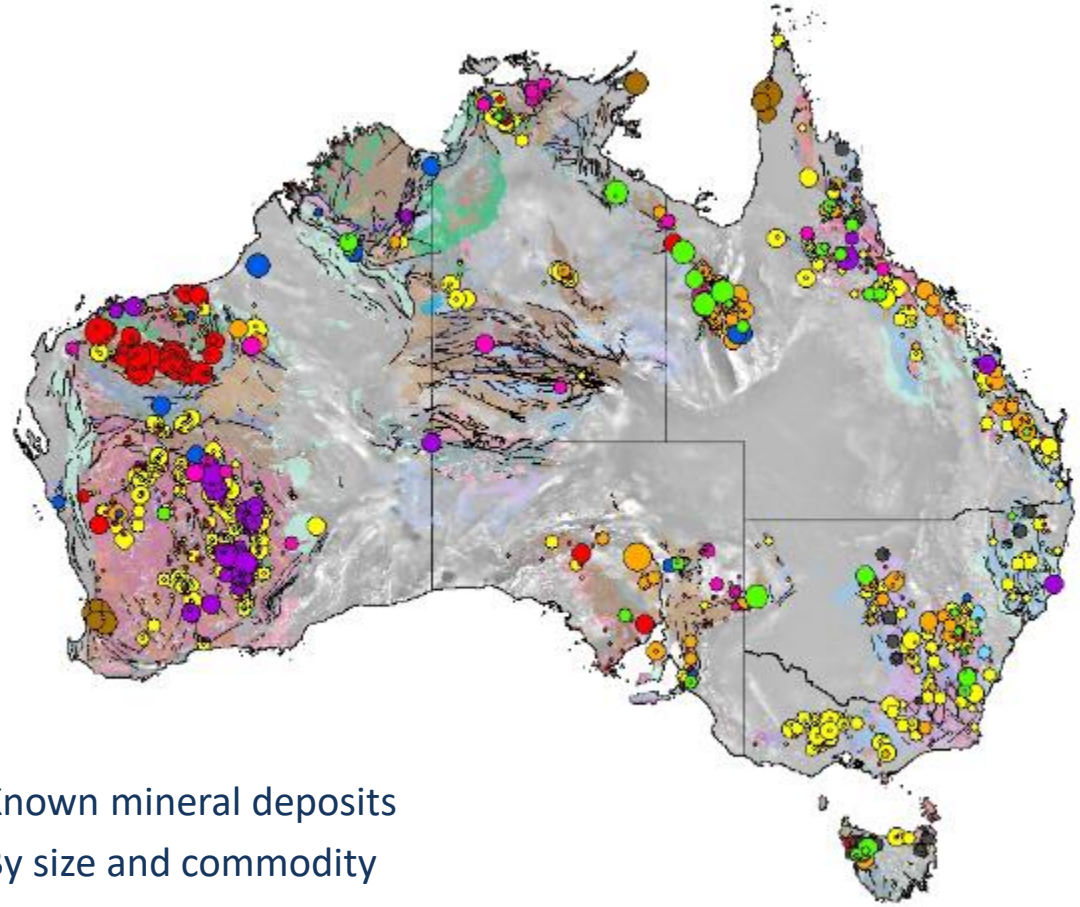
Open file drilling

Coloured for proximity to nearest neighbour

MinEx CRC

Where we drill we discover

Drilling under cover required



Known mineral deposits

By size and commodity

Cooperative Research
Broad base, significant size

36 Participants contributing:

- $41M cash
- $49M non-staff in-kind
- 311 FTE ($78M equivalent)
- $50.0M CRC Program funding

10-Year Goals

- Australia re-established as the preferred destination for mineral exploration investment, resulting in discoveries
- METS sector thriving taking uncover exploration tools and techniques to the world
- Next generation of professionals and drilling experts trained

Industry Led Agenda

- More efficient drilling technologies to drill more holes
- Safety and environmental factors
- Collect and interrogate data while drilling to inform decisions
- Drilling deployments to optimise technologies and uncover new mineral provinces through National Drilling Initiative (NDI)
- Training and Education vital

Majors, METS and Survey Participants (16)

Research Participants and Affiliates (20)

MinEx CRC

MinEx CRC

Programs and Projects

Program 1: Drilling Technologies

- P 1: Drilling Optimisation
- P 2: Coiled Tubing Drilling for Definition of Mineral Deposits

Program 2: Data from Drilling

- P 3: Real-time Downhole Assay
- P 4: Petrophysical Logging While Drilling (LWD)
- P 5: Seismic in the Drilling Workflow
- P6: Automated 3D Modelling

Program 3: National Drilling Initiative

- P 7: Maximising the Value of Data and Drilling Through Cover
- P 8: Geological Architecture and Evolution
- P 9: Targeting Mineral Systems in Covered Terranes

Mining/METS Companies

Geological Surveys

Education and Training Program

Opportunity Fund

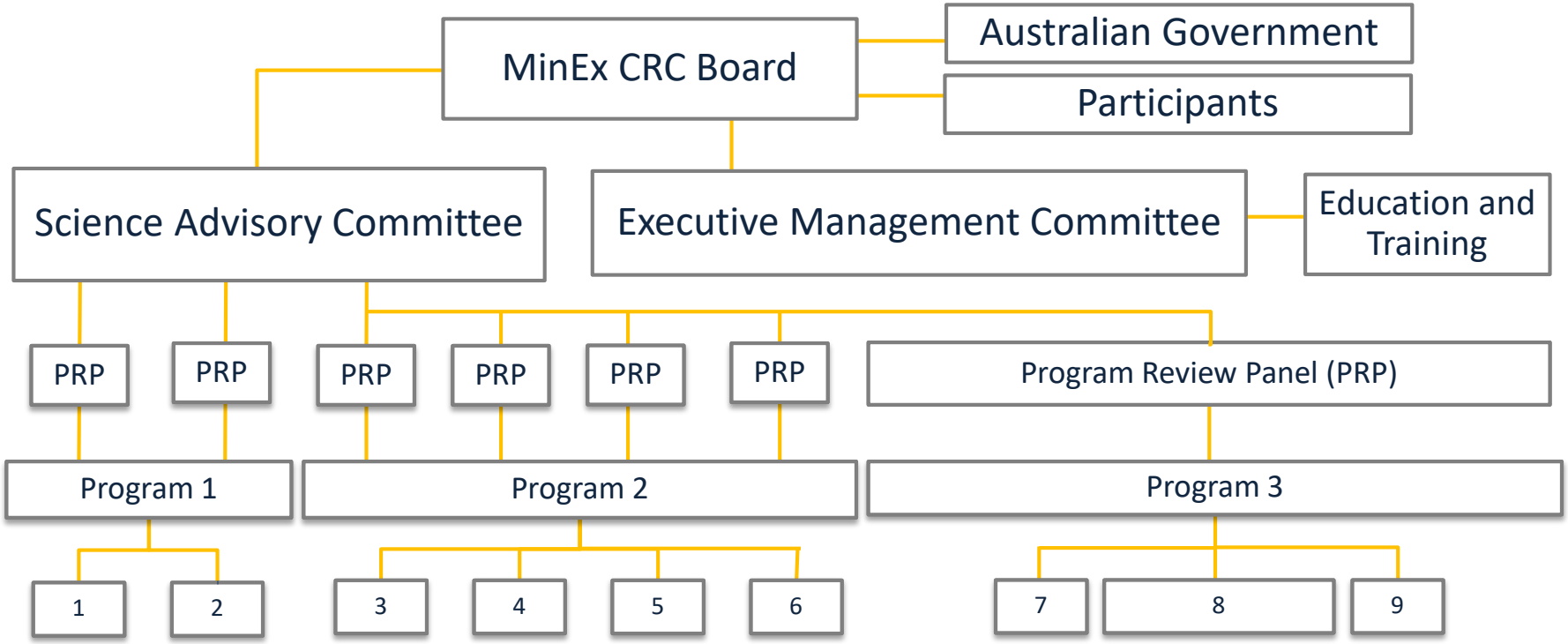
Conclusions

- Demand and range of minerals required increasing
- Mining is required - Exploration is required – Surveys are required
- Exploration under cover is required in Asutralia
- Exploration innovation requires Cooperative approach and sustained but directed research

minexcrc.com.au

Find us on LinkedIn

Structure


MinEx CRC Board
Australian Government
Participants
Science Advisory Committee
Executive Management Committee
Education and Training
PRP
PRP
PRP
PRP
PRP
PRP
Program Review Panel (PRP)
Program 1
Program 2
Program 3
1
2
3
4
5
6
7
8
9

Program 1: Drilling Technologies

Program Leader: Soren Soe (UniSA)

Project 1: Drilling Optimisation and Automation
Project Leader: Masood Mostofi (Curtin)

To improve average drilling performance of rotary and percussive drilling by 50% using real-time and post-mortem optimization and drilling automation by increasing productivity and consistency.

Focused on tackling the barriers of drilling optimization and automation by:

(a) engineering modelling of various processes involved in drilling operation,
(b) systematic and reliable recording of drilling data, used for optimization,
(c) developing engineering algorithms that can be used for optimization of the drilling operation and autonomous analysis of drilling data, and,
(d) developing a modular autonomous optimization system that can pave the way towards complete automation.

Program 1: Drilling Technologies

Program Leader: Soren Soe (UniSA)

Project 2: Coiled Tubing Drilling for definition of Mineral Deposits
Project Leader: Soren Soe (UniSA)

To improve the sample integrity of CT drilling to that of diamond drilling, then develop the ability to drill multiple deviated holes, up to 1000 m reach, from a single pad, to within 10 m of target and surveyed within 1 m, whilst maintaining the cost, rapidity, safety and environmental benefits of a greenfield CT rig.

Program 2: Data from Drilling

Program Leader: Yulia Uvarova (CSIRO)

Project 3: Real-time Downhole Assay
Project Leader: Yulia Uvarova (CSIRO)

A real-time downhole quantitative analytical technique that provides a broad suite of chemical elements for targeting in greenfield environments at detection limits that allow robust and reliable real-time decisions, including a downhole sensor for Au assay whilst drilling and enable reliable decisions without further analytical work.

CSIRO has previously identified laser-induced breakdown spectroscopy (LIBS) as a potential candidate. LIBS requires little to no sample preparation and has high potential to deliver elemental concentrations in real-time measurements downhole, but the challenge is to adapt this technique to measurements on a moving, uneven, and wet surface.

Program 2: Data from Drilling

Program Leader: Yulia Uvarova (CSIRO)

Project 4: Petrophysical Logging While Drilling (LWD)
Project Leader: Brett Harris (Curtin)

Achieve real time subsurface sensing during CT drilling to depths of 1000m and to provide real time imaging to assist geo-steering to within 30 m of a lithological target.

New LWD sensors and real time subsurface reconstruction algorithms will be designed to integrate within exploration or mining workflows. This research has two linked components; (i) development of new sensors for real time multi-parameter logging while drilling with a Coil Tubing drill rig and (ii) automatic subsurface reconstruction for steering based on geophysical sensing while drilling.

Program 2: Data from Drilling

Program Leader: Yulia Uvarova (CSIRO)

Project 5: Seismic in the Drilling Workflow
Project Leader: Andrej Bona (Curtin)

Aims are for a:

- Reduction of borehole seismic survey costs by 50% from current.
- Reduction of need for brownfields exploration drilling by 50% due to application of seismic methods.

Seismic sensor technologies are aimed to be deployed in boreholes, underground workings and on the surface, to deliver data for continuous updating of a subsurface geological model.

Program 2: Data from Drilling

Program Leader: Yulia Uvarova (CSIRO)

Project 6: Automated 3D Modelling
Project Leader: Mark Jessell (UWA)

Diverse geological data - collected from drilling, from surface exposure, or derived from geophysical data – are to be incorporated into probabilistic 3D models within 1 week of data being available in appropriately formatted and accessible databases.

The models will be explicitly designed to deal with uncertainty and facilitate exploration and resource development decisions, rather than portray one or more geological models of “subjective reality”.

Program 3: National Drilling Initiative

Program Leader: TBC

Project 7: Maximising the Value of Data and Drilling Through Cover
Project Leader: Simon Van Der Wielen (Geoscience Australia)

To develop software solutions that will maximize the value of NDI data by:

1. Delivering the tools and data infrastructure to facilitate upload and management of legacy data and NDI drilling data and information, delivered to stakeholders, researchers and the wider geoscience community.
2. Develop and incorporate advanced geospatial data analytics so that the maximum amount of geoscientific information can be extracted from legacy data.
3. Maximise the efficiency and value of drilling for optimising drill program design and providing drill target rankings relative to end-user defined questions.

Program 3: National Drilling Initiative

Program Leader: TBC

Project 8: Geological Architecture and Evolution
Project Leader: Alan Collins (UoA)

To provide new geoscience data and knowledge of the geology in NDI case study regions via integration of geophysics and petrophysics, regolith and hydrogeology, alteration signatures, basin analysis, and igneous and metamorphic analysis.

These new geoscience data and knowledge are aimed to inform the 3D geology and 4D geological evolution of the case study areas and aid in the identification of known and potential mineral systems within.

Program 3: National Drilling Initiative

Program Leader: TBC

Project 9: Targeting Mineral Systems in Covered Terranes
Project Leader: Alex Otto (CSIRO)

- To create a new generation of multi-scale exploration targeting models for selected mineral systems within the NDI case study areas, that represent and quantify the geological characteristics of each mineral system type.
- To integrate temporal and spatial geoscientific data for specified regions with existing understanding of mineral systems to create maps of mineral potential.
- To provide advice on the most valuable data types, sampling media and sampling densities to map footprints of relevant mineral systems.
- To test and refine exploration targeting models and mineral potential maps by utilizing MinEx CRC drilling technology and research.

National Drilling Inititaive

AIM: To

- To create a new generation of multi-scale exploration targeting models for selected mineral systems within the NDI case study areas, that represent and quantify the geological characteristics of each mineral system type.
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Mining/METS Companies

Geological Surveys

Education and Training Program

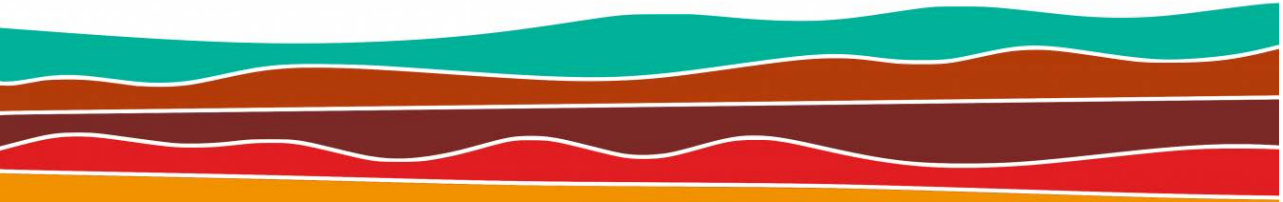
Opportunity Fund

National Committee for Earth Sciences

A COMMITTEE OF THE AUSTRALIAN ACADEMY OF SCIENCE

Australia's decadal plan for Geoscience: what it means for industry

decadal Plan for Australian Geoscience 2018-2027



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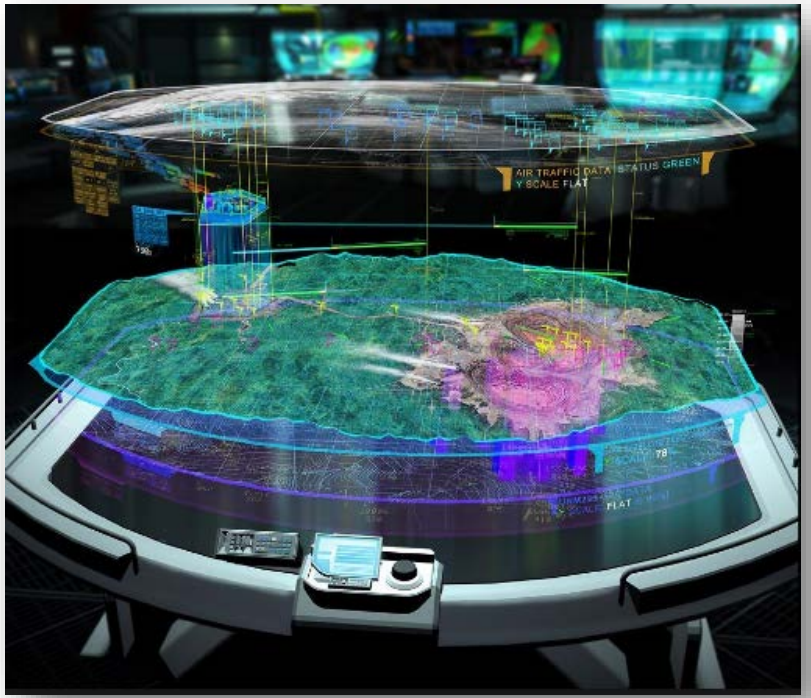
OUR PLANET, AUSTRALIA'S FUTURE

Science fiction as an expression of the future of exploration

Portable detection – Star Trek



Direct imagery - Avatar

What can we learn from our past?

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The CRAESTAR

EXPLORATION RADIO

www.explorationradio.com

Available on iTunes

We must not forget the lessons we have already learnt

What is this document?

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Who are the Australian Academy of Science?

Supports science in discipline areas through national committees including: **National Committee for Earth Sciences (NCES)**

International engagement

- International Union for Quaternary Research *(IUQR)*
- International Union for Geodesy and Geophysics *(IUGG)*
- International Union for Geological Sciences *(IUGS)*

National engagement

- University, Government and Industry Earth Scientists

Our National initiatives

Australian Academy of Science

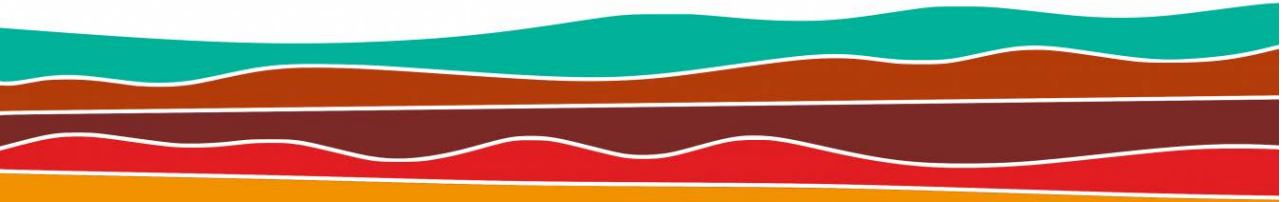
1. **UNCOVER** + AMIRA UNDERCOVER Roadmap

uncoveraustralia.org.au

2. Infrastructure Reviews and strategy

- NCRIS AuScope future strategy
- Chief Scientist national infrastructure review

3. **NCES Decadal Plan**



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Decadal Plan - purpose

Australian Academy of Science

This document is intended to inform:

- **the Australian Government**,
- government and funding agencies
- supporting education and research relevant to the geosciences,
- other stakeholders—
  - ✓ geoscientists,
  - ✓ universities, education institutions,
  - ✓ professional associations,
  - ✓ **industry**
  - ✓ associated peak bodies.

DECADAL PLAN
FOR AUSTRALIAN GEOSCIENCE
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What did the last Strategic Plan do?

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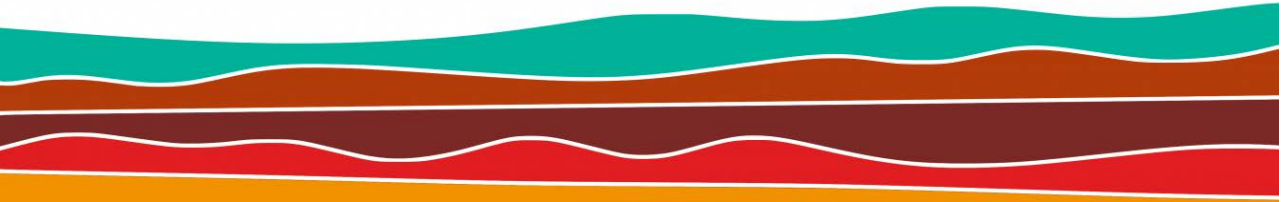
'Geoscience – unearthing our future'

2003

- Blue water research ship: RV Investigator
- Continent-wide transects (e.g. reflection seismic)
- NCRIS AuScope funding
- UNCOVER initiative

- > **$500m extra funding** to Earth Sciences through implementation



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Decadal Plan in a nutshell

Evolution from the reductionist approach of last century
to
a complex system science approach

Integration across sub-discipline boundaries in a digitalised environment

A decade of transition

The state of our Planet

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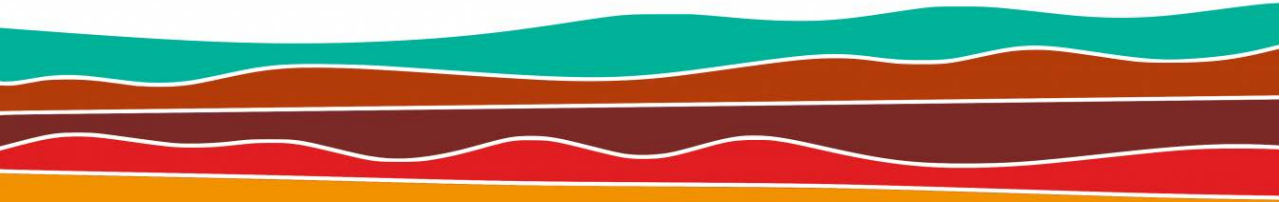
Next decade will be a critical period in human history as we continue to place the planet under increasing pressure

New understanding of, and innovative approaches to, sustainability
Overarching challenge to develop accurate **predictive power** about :

- **how** our planet will behave,
- how it will respond to our actions, and
- **where** to explore for critical resources.



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Decadal Plan process

Fundraising

Information gathering

Draft writing

Consultation

Final drafting

Production

Launch

IMPLEMENTATION

Financial support from:

- GA and State Surveys
- ~ 10 Australian Earth Science university departments
- IAG, GSA
- ARC
- Australian Academy of Science

Online Survey
Town hall presentations
Exposure Draft circulated 9/2017 for comments

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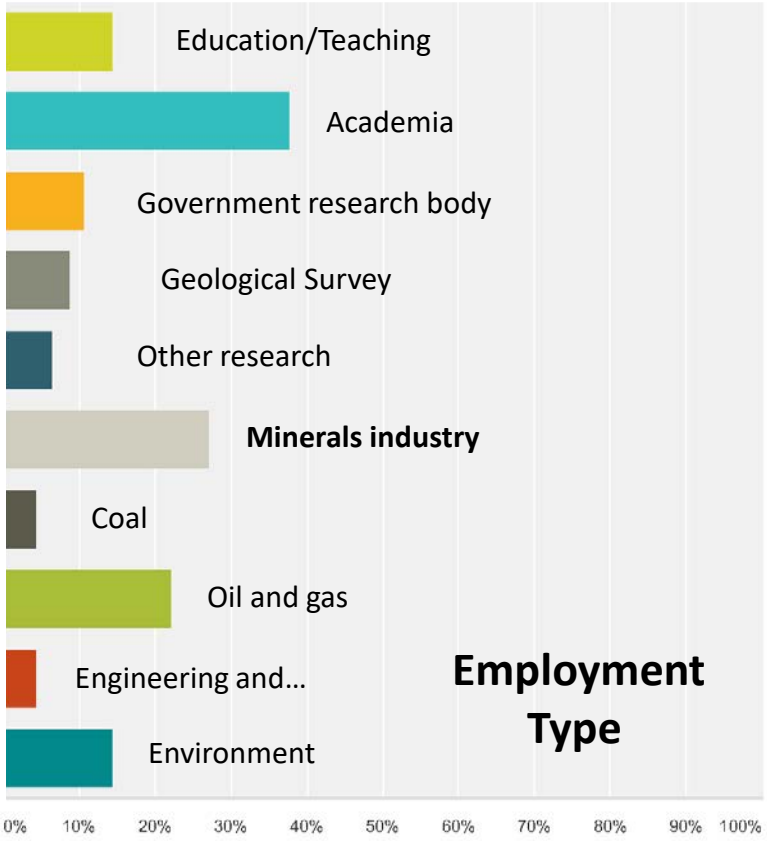
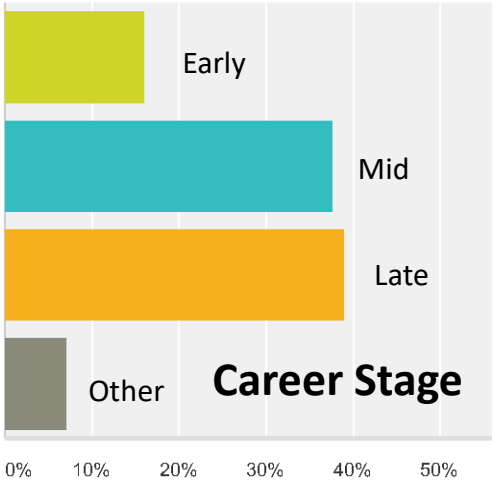
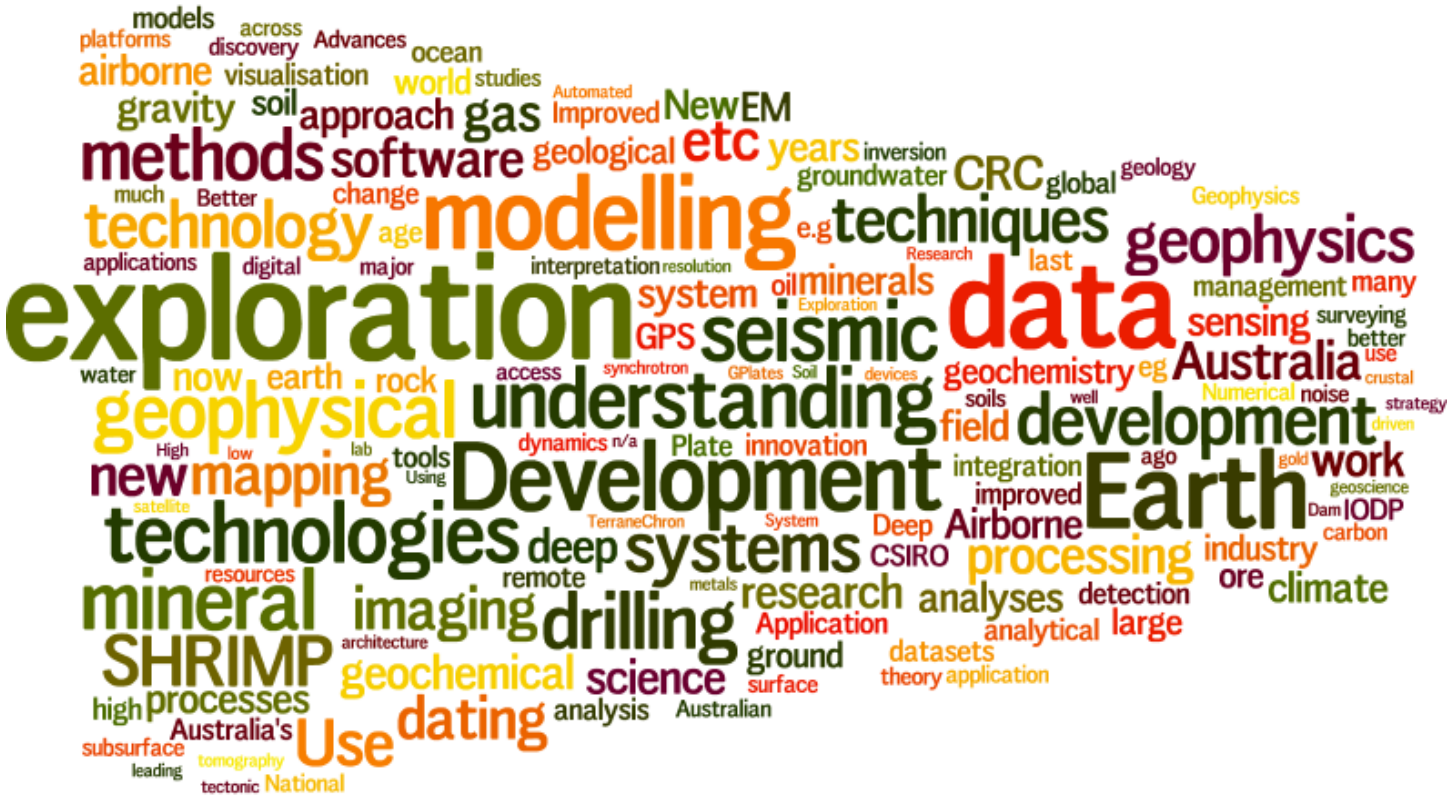
Who have we talked to?



- On-line survey (575)
- Committee is cross section across earth sciences
- Solicited comments



We asked you for your opinion on past innovation in the Earth Sciences?



We have a proud history BUT we are asking for more

Grand Challenges

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Australia's Evolution: the deep interior and deep time

The Earth Science downward-looking telescope

Real-time dynamism of Earth's crust

Earth today: neotectonics and surface stress states - earthquake prediction; current processes; sedimentary basin resources; real time monitoring; satellite and remote sensing

Earth history contained within the geological record

How has life on Earth driven/impacted upon the planet's evolution?
How has Earth's climate changed through time and how best can we predict and plan for the impacts of our own actions upon the planet?

Transforming Earth Science

A bigger picture view: developing whole-Earth capabilities
Investing in education and training

Advocacy: engaging the community at all levels

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‘Learn the macro from the micro’

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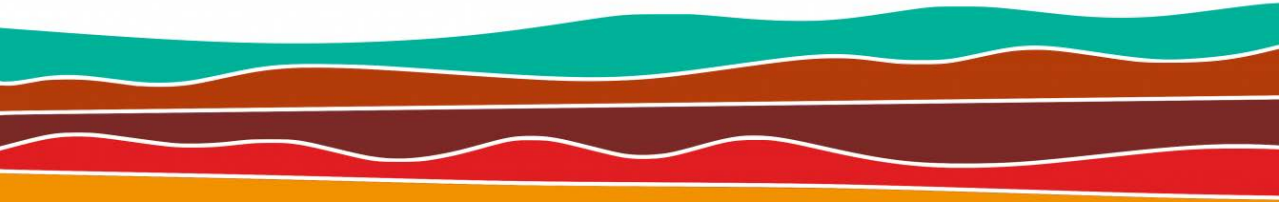
Over the past decade instruments, methodologies and techniques have been developed to *image and determine the composition of* crust and mantle materials at the atomic to micro-scale. **‘Learn the macro from the micro’**



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The Mineral Exploration burning platform

- Australia's share of resources will dwindle
- Easy deposits already found
- Need new exploration methods **and** *predictive* framework for ore *systems.*
- **Giant deposits needed**

Minerals + oil/gas = 75% of Australia's foreign exchange earnings

UNCOVER has permeated Australian geoscience

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	Scale Reduction Goals		
Theme	**Terrane to Regional**	**Regional to Camp**	**Camp to Deposit**
Characterising the Cover			
Whole lithospheric architecture			
4D Geodynamic evolution and metallogenesis			
Distal mineral footprints			
Risk/reward for covered economic resources			
Research education and training	Research, education and training is an underpinning and high priority focus area. As it maps across all scales it was not mapped in the Scale Dependency Matrix		

AMIRA Road map Rowe et al 2017

UNCOVER
AUSTRALIAN EXPLORATION GEOSCIENCE RESEARCH

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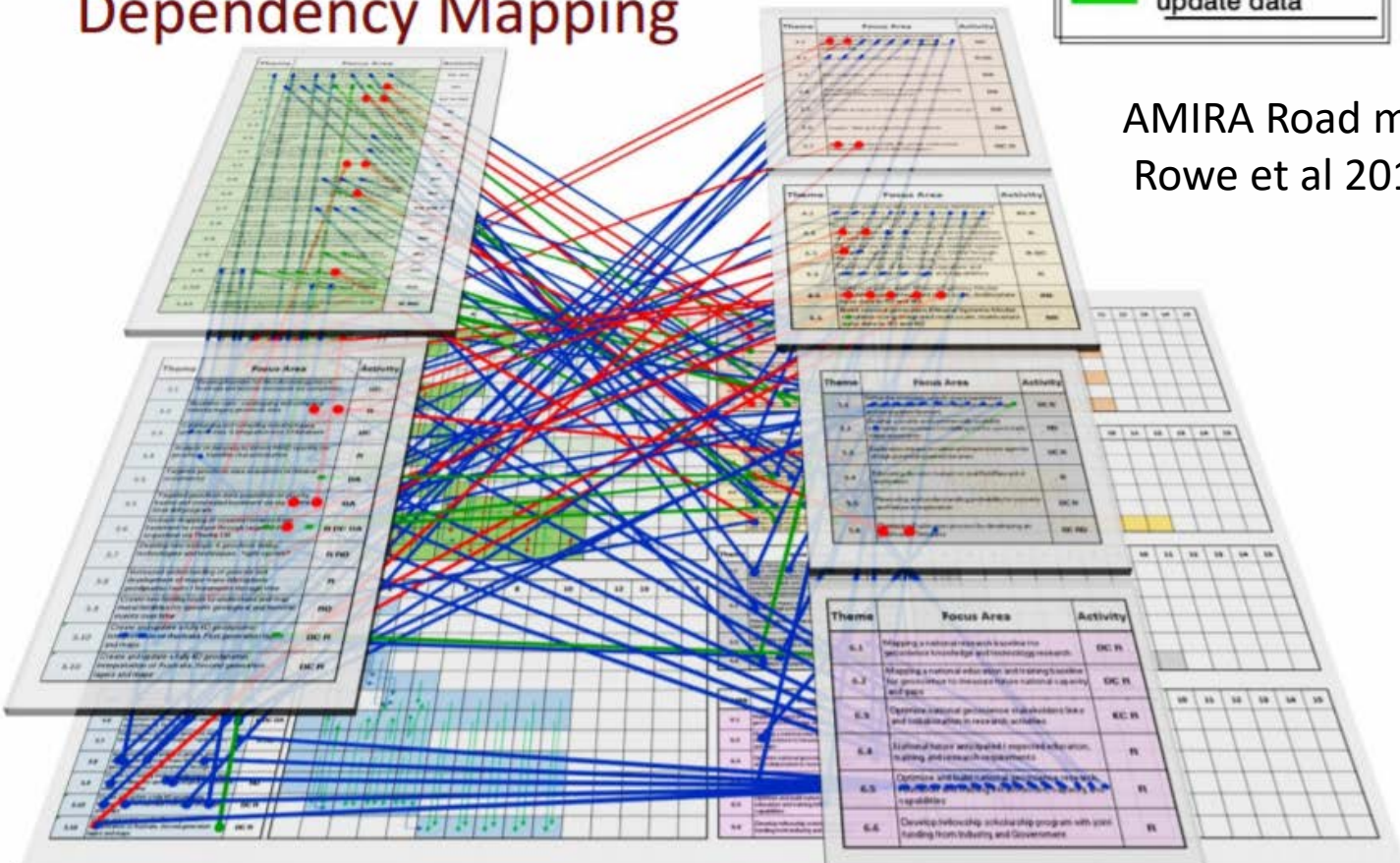
Roadmap – Stage 1 Results

Dependency Mapping



AMIRA Road map
Rowe et al 2017

The federal and state survey response to the plan has been impressive

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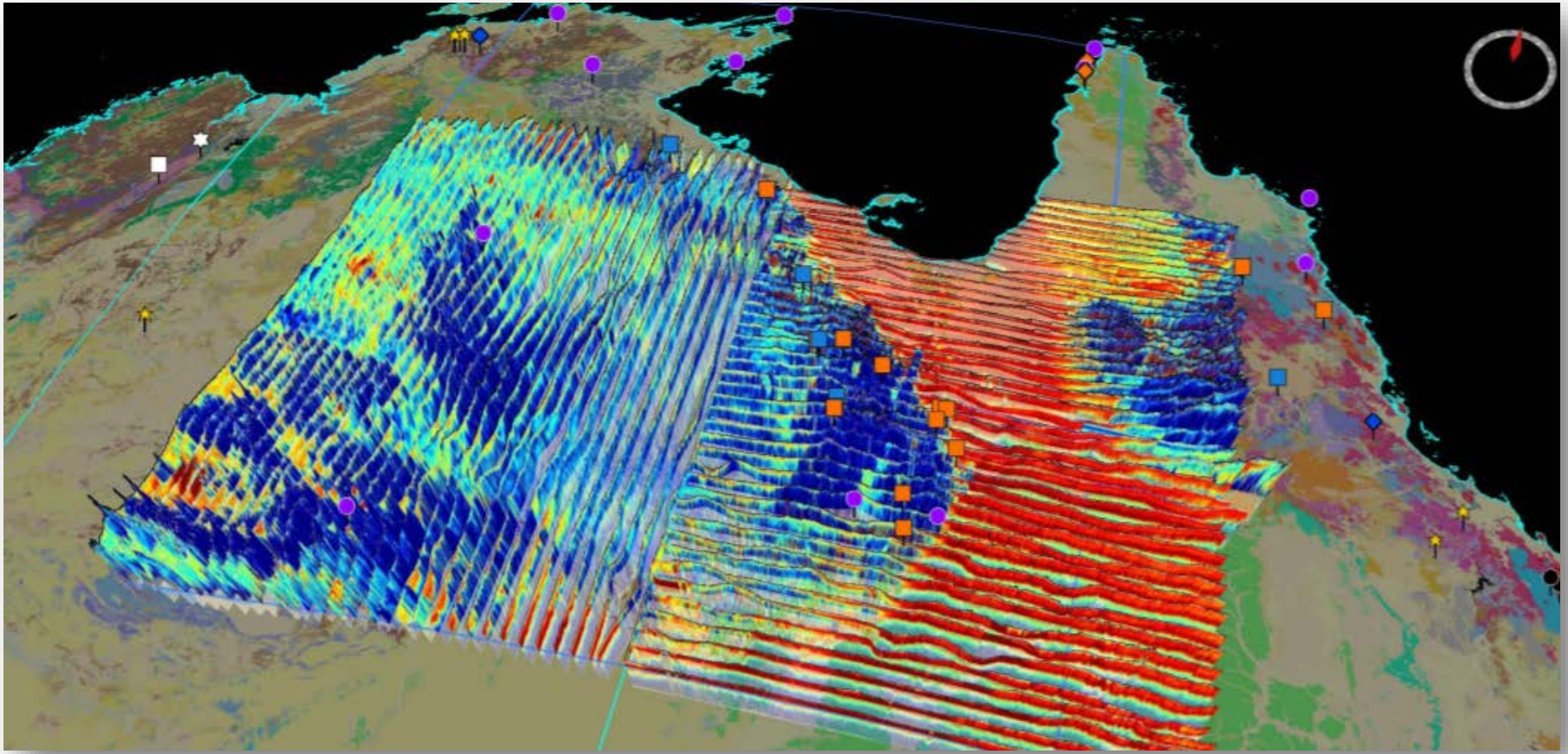
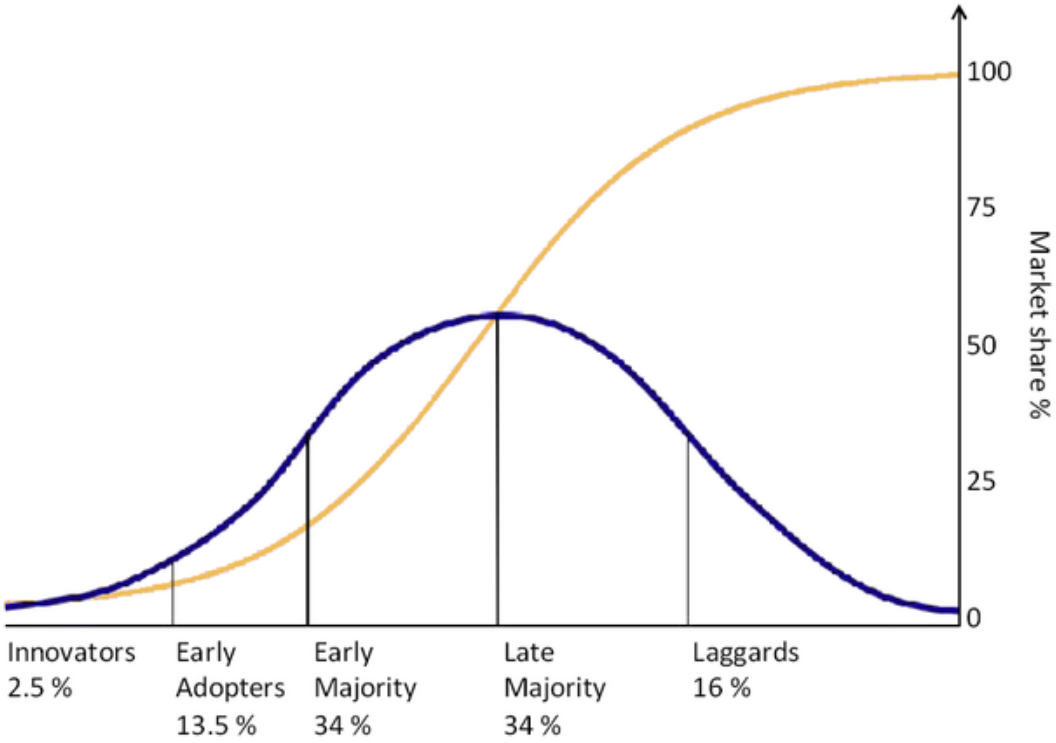


Where are you on the adoption curve?



….and who/what are you waiting for

What roadblocks are in our way?

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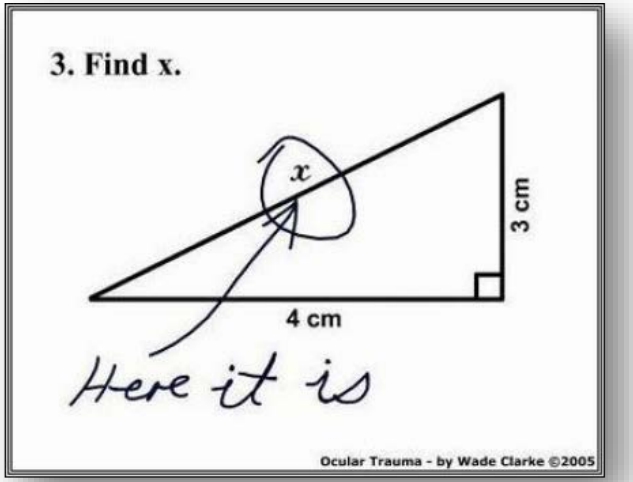
More expertise in physics, maths!



Education
Training
New types of exploration scientist

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We **MUST** cross disciplines. All search sciences have a lot in common

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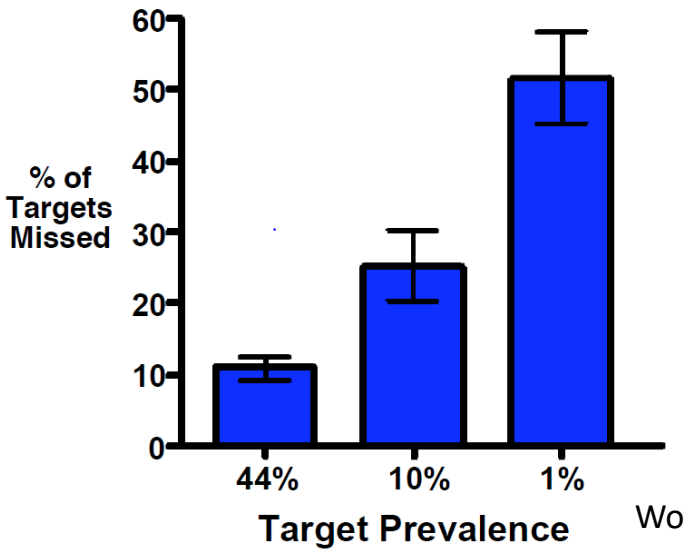
Rare objects are hard to find and easy to overlook

Search space

Prediction



Base rate

Bayes Law

Wolfe et al 2005

We are/will employ non geology scientists

We can learn from other sciences and industries?

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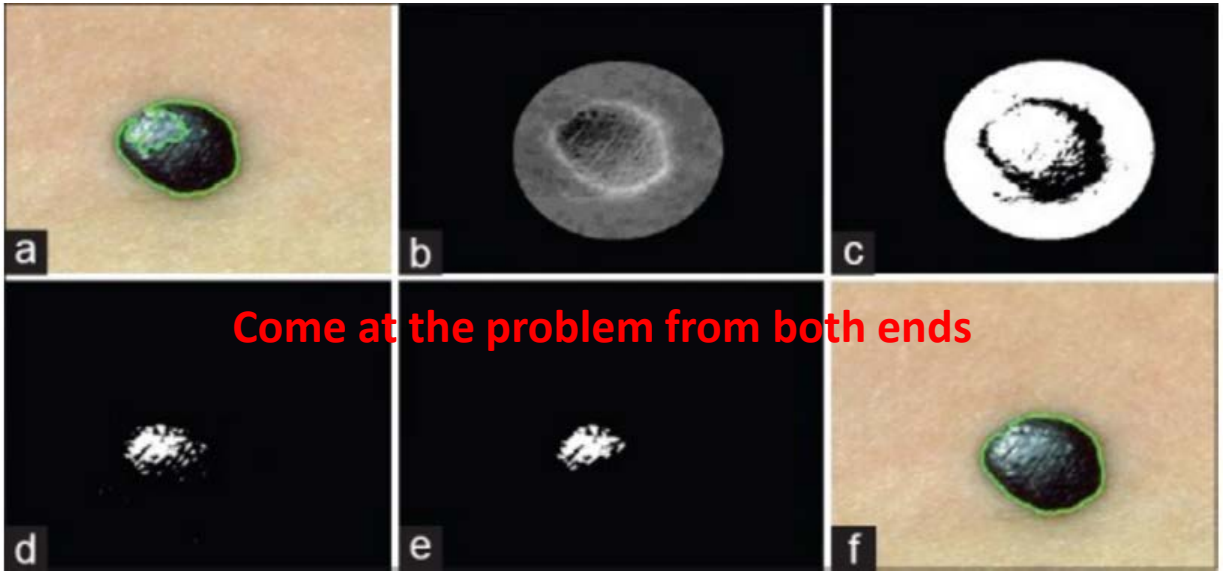
At present we can't predict or image melanoma early enough

The biological system is at present too complex

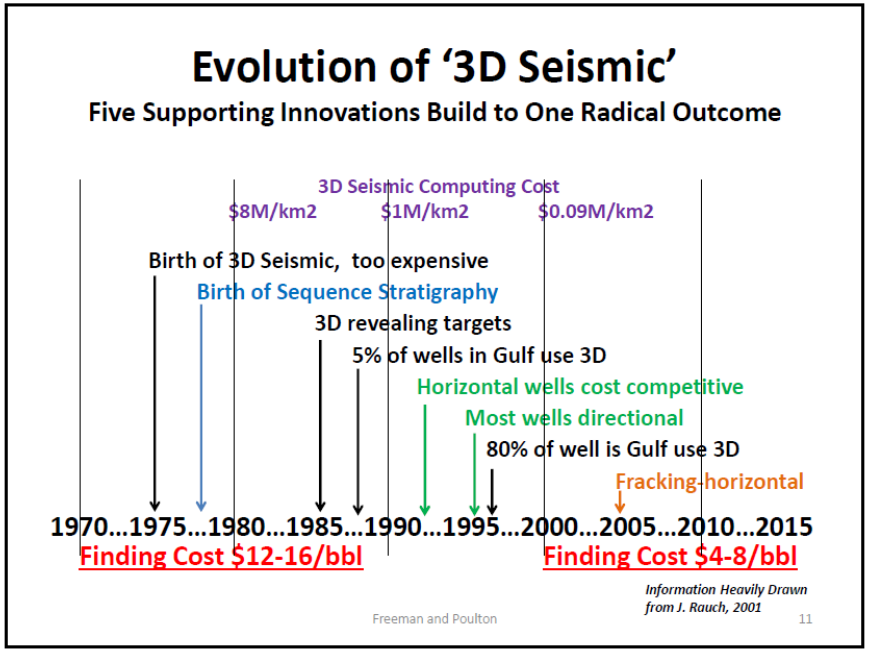
The footprint is too restricted



Come at the problem from both ends

We cant just talk to ourselves

We over simplify the 'analogous' petroleum transition



- 3D seismic took 20 years to impact
- Required the development of sequence stratigraphy
- Two orders of magnitude cost reduction which came from adopters
- Hindsight bias paints an easier picture

Exploration Geoscience includes fundamental science

What does it mean for industry?

- Geologists will become better (and need to)
- Augmentation of your skills (not replacement)
- Interpretation (integration) skills
- Automation of ‘manual’ tasks WILL occur
- All this will happen faster than we think

- We will interpret ‘hidden data’
- We will change sampling strategies
- Exploration Geoscience will grow (separately from Economic Geology)

- *Companion document online contains more detail*
- *Committee and direct contributors listed in printed and online Plan*

www.science.org.au/support/analysis/decadal-plans-science

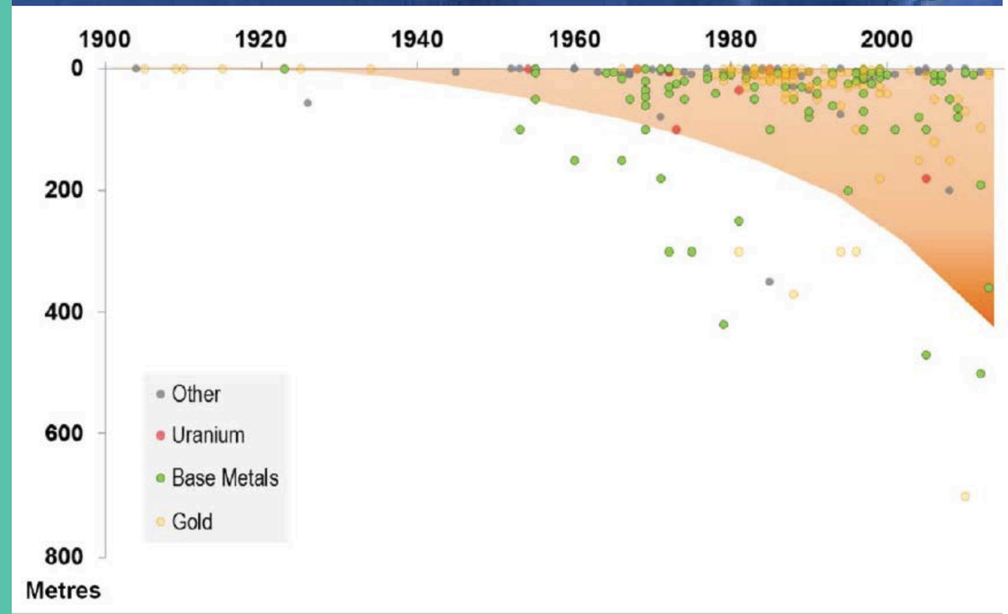
Peter Sorjonen-Ward

AuScope | Answering Australia's Geoscience Questions

Supporting Australian exploration industry research impact through AuScope investment in the downward looking telescope

Tim Rawling, AuScope CEO

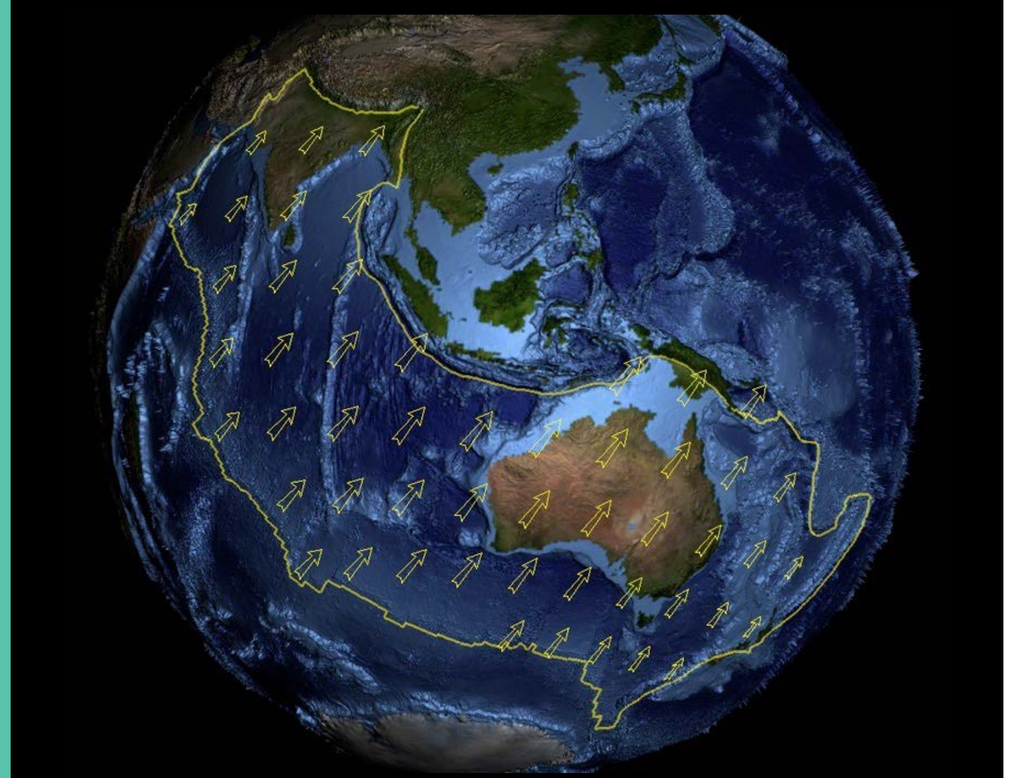
NCRIS National Research Infrastructure for Australia
An Australian Government Initiative



AuScope

Australian context

- Old, cold and cratonised
- Search space is becoming mature and exploration is being forced deeper and under transported cover



Australian context

- Large, fast moving plate
- Complex active plate boundaries and geoid geometries

- Highly stressed crust (mostly in compression) and underestimated seismic hazard

Introduction

AuScope

- AuScope was established in 2006 to implement an Earth and Geospatial science infrastructure program
  - National Collaborative Research Infrastructure Strategy (**NCRIS**) Program – *"Structure and Evolution of the Australian Continent"*
  - Education Investment Fund (**EIF**) Program –*AGOS*
- $110M Commonwealth investment and $17M cash & $154M in-kind co-investment from partners

AuScope

- *AuScope's purpose is:*
  - *To create widely available access to earth and geospatial science research infrastructure (equipment, data and analytics) to drive front edge Australian scientific research and support scientific investigations in government and industry*

Partners

Australian National University

Curtin University of Technology

MONASH University

AuScope

The University Of Queensland AUSTRALIA

Macquarie University

The University of Sydney

The University of Adelaide

University of Tasmania

The University of Western Australia

Australian Government
Geoscience Australia

The University of Melbourne

CSIRO

Queensland Government

Government of Western Australia

State Government Victoria

Tasmanian Government

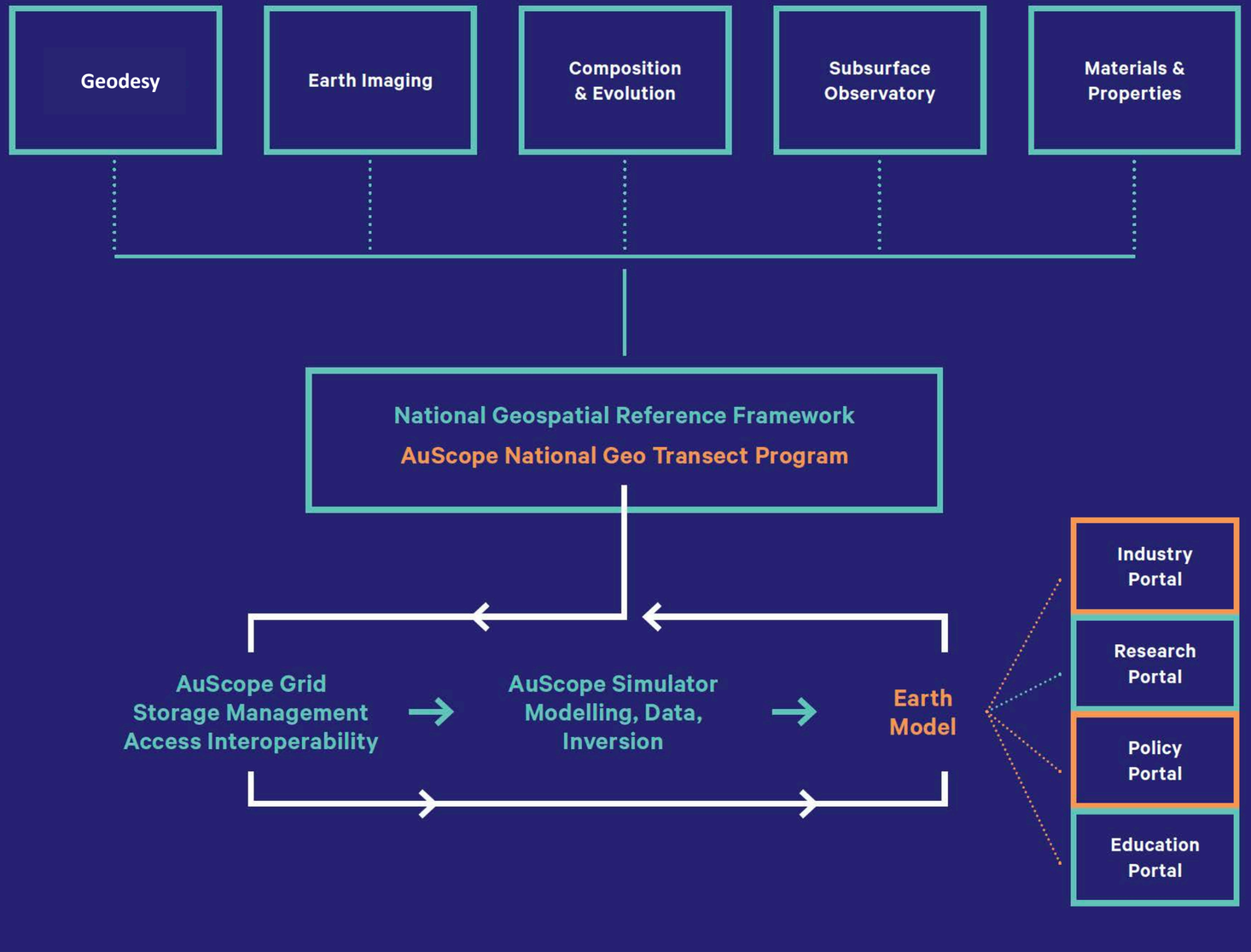
Northern Territory Government

Government of South Australia

NSW Government

Visio
n

AuScope



Infrastructure Programs

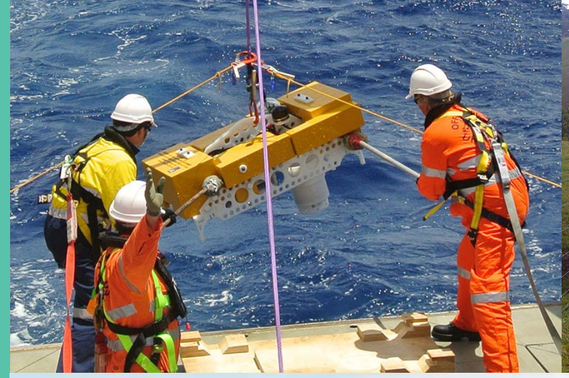
Geospatial Program

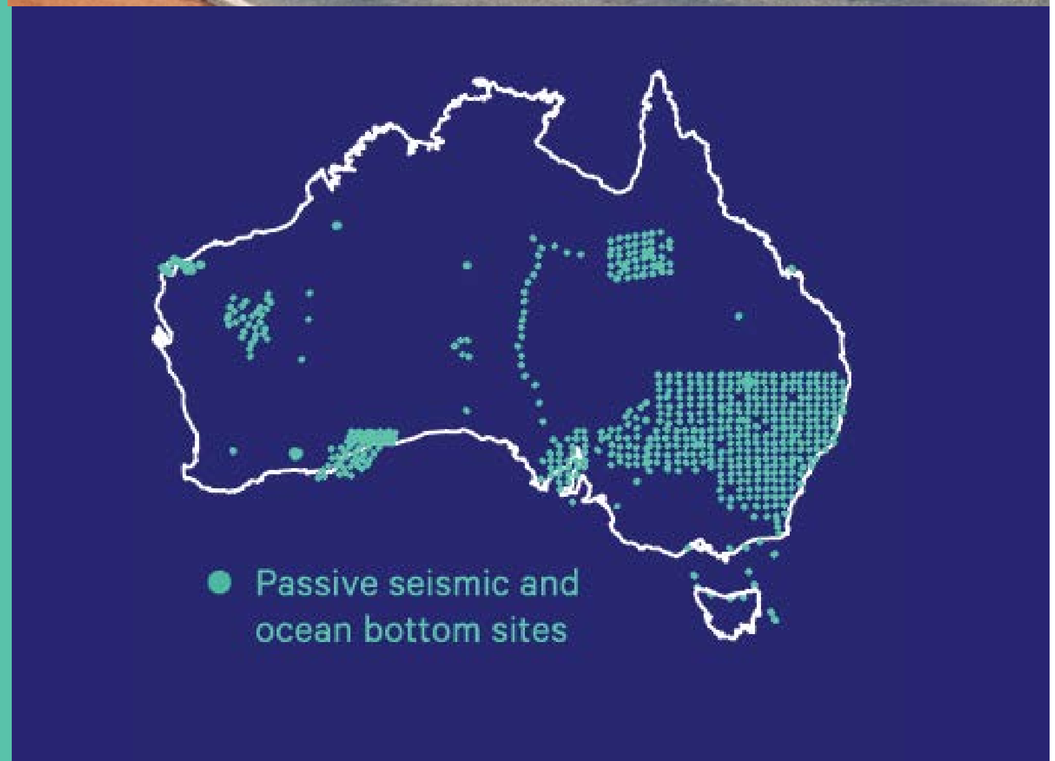
AuScope

The AuScope **Geospatial** Program is responsible for the acquisition and deployment of VLBI telescopes, GNSS sites, absolute gravity measurement, GPS calibration robots and satellite laser ranging sites throughout Australia.

Provides data that underpins Australia's dynamic geodetic framework in which to observe movement, change and deformation in the Australian Plate.

Earth Imaging - Seismology

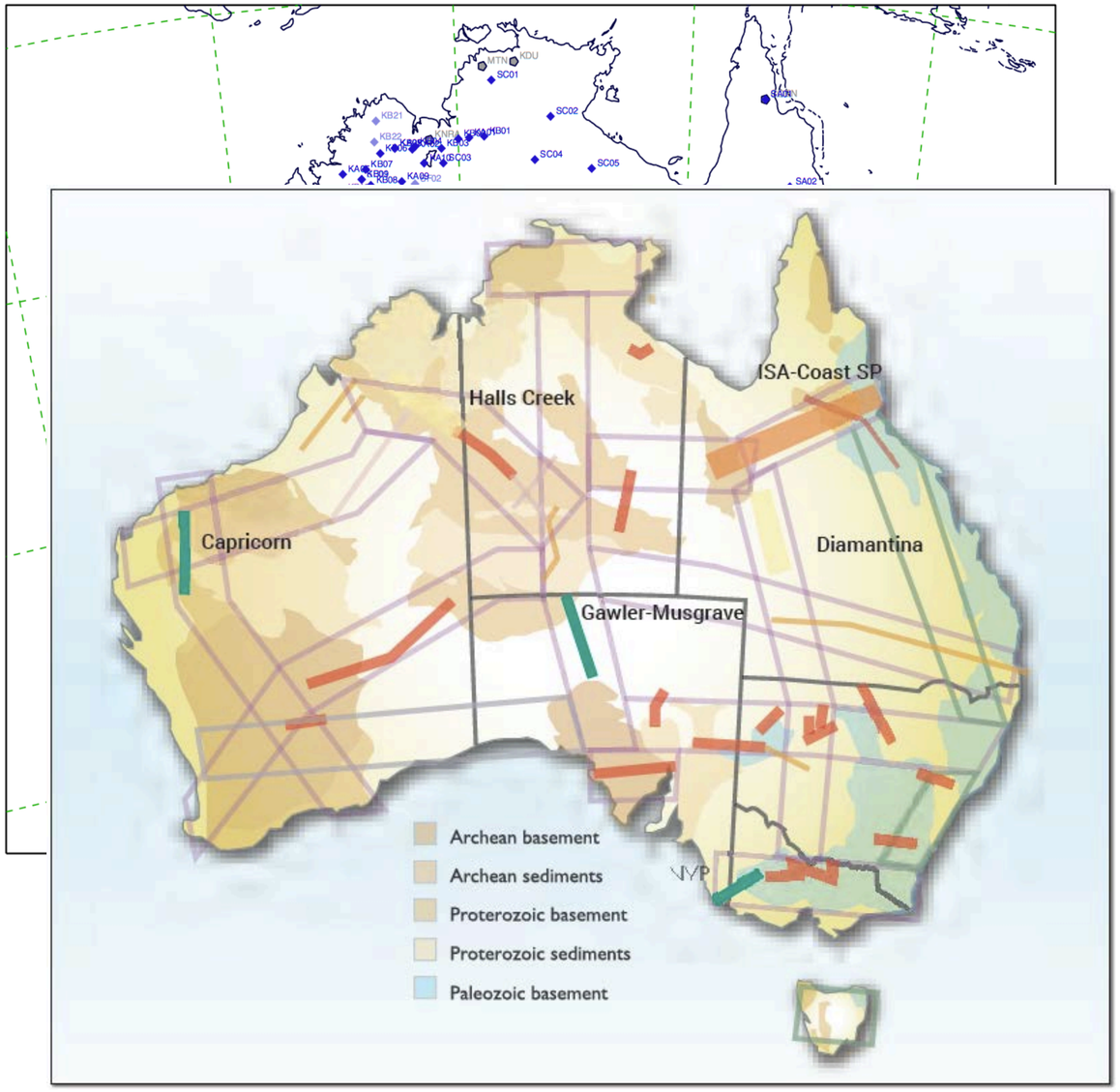




AuScope

The AuScope **Earth Imaging** program works with partners at Geoscience Australia and State GSO's to support the deployment of the AusArray Passive Seismic and AusLAMP MT Arrays in addition to the management of an OBS research fleet and supporting the national reflection seismic transect program.

Earth Imaging - Seismology



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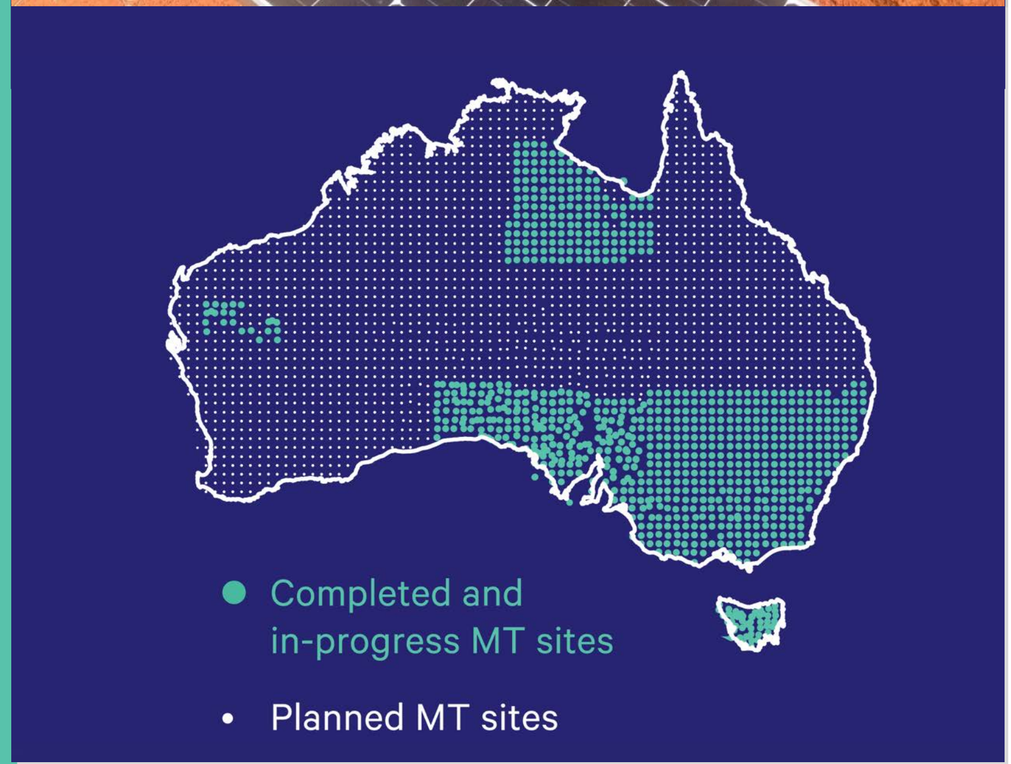
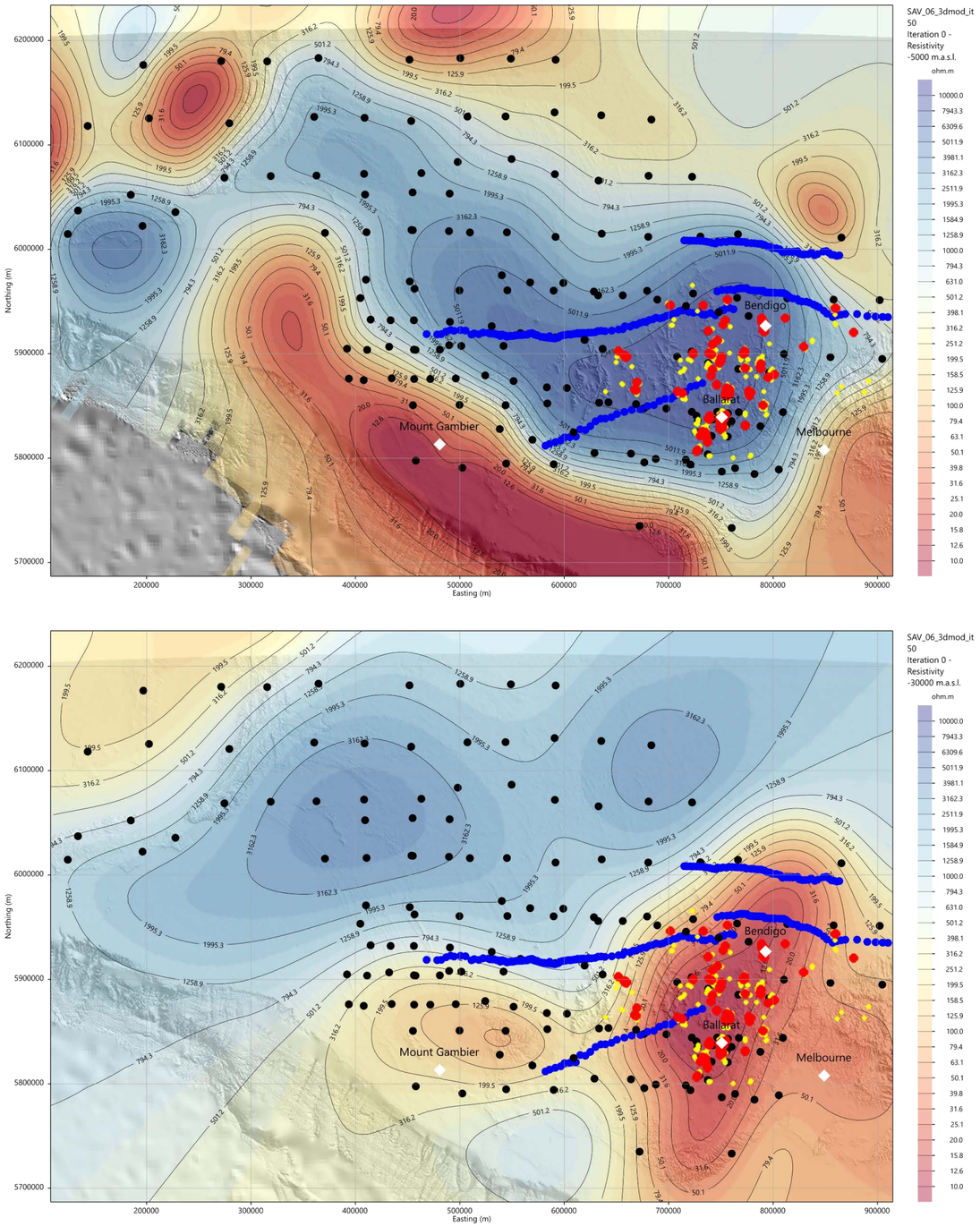
Earth Imaging - Magnetotellurics



AuScope

- Australian Lithospheric Architecture Magnetotelluric Project (AusLAMP) program
- Collaboration between University of Adelaide, GA and AuScope
- National long-period MT data at approximately 2800 sites across Australia to map the electrical conductivity of the continent in three dimensions

Earth Imaging - Magnetotellurics



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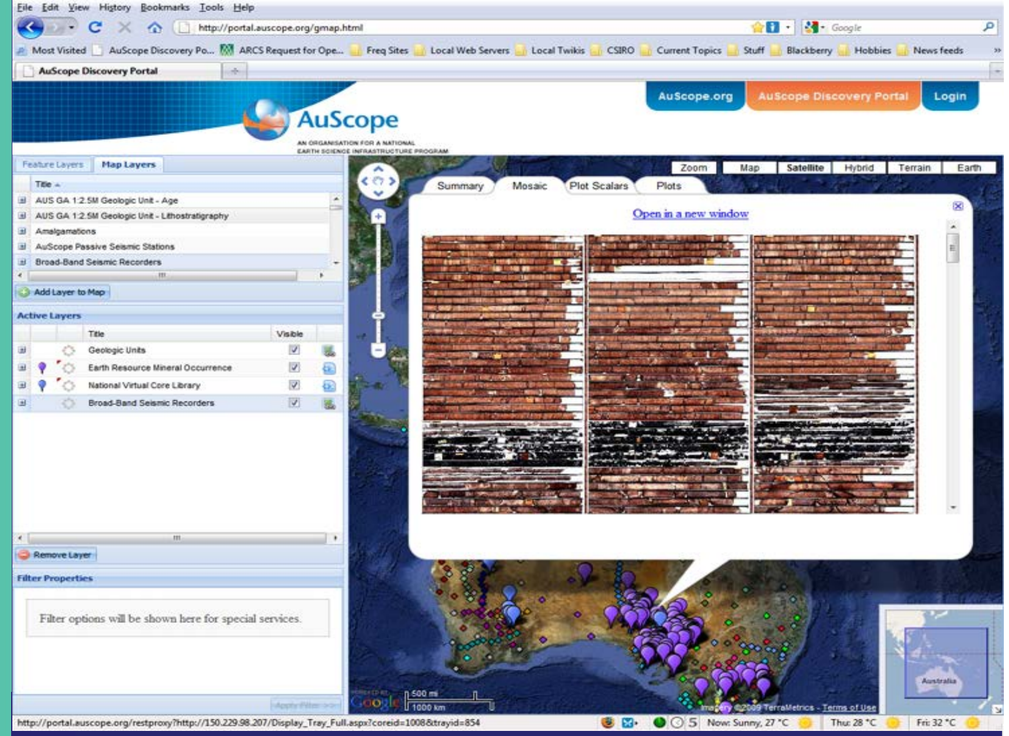
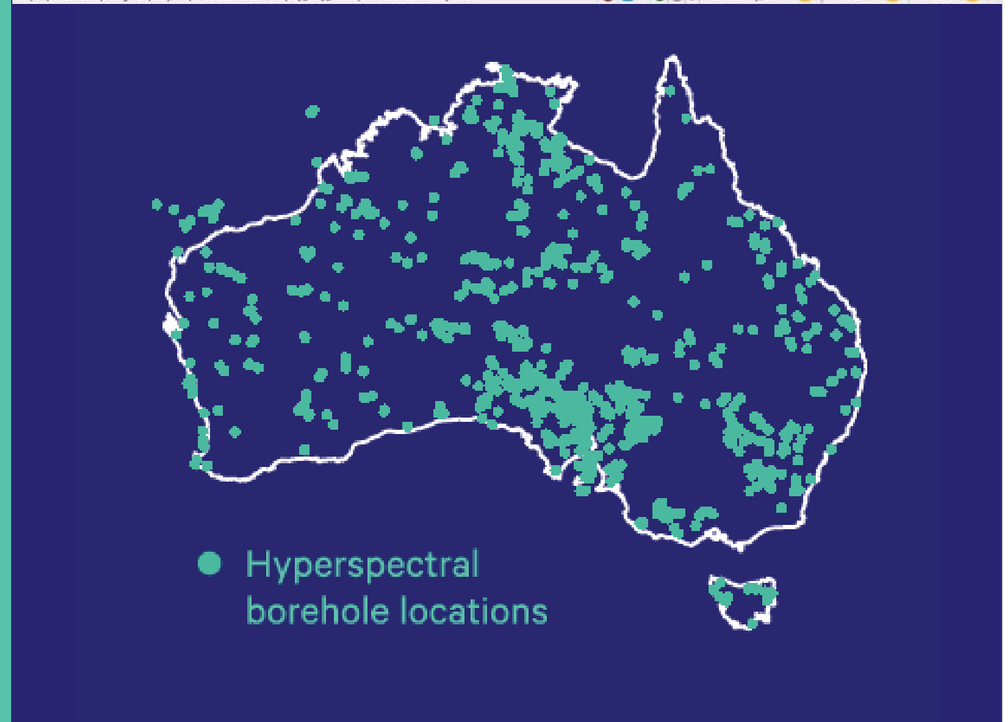
Materials and Properties

Materials and Properties





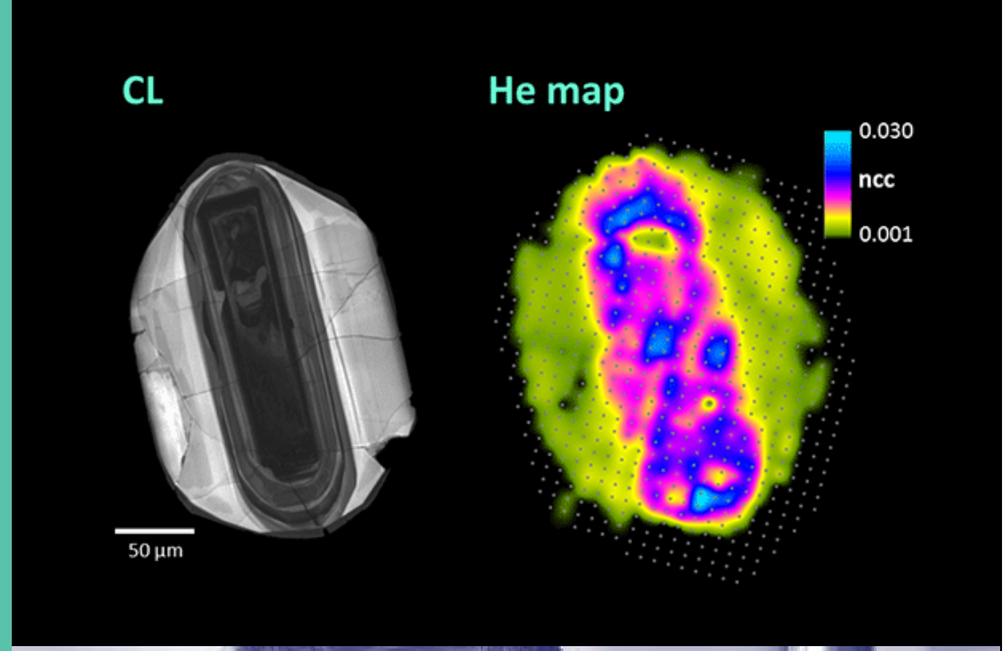
AuScope

- The AuScope **National Virtual Core Library** facilitates the collection, storage and discovery of high quality, semi-quantitative hyperspectral mineralogical data from drill core collected across the Australian Continent.

- Each year around $600 million is spent on drilling in Australia but too often the core is only partially logged and then discarded. This program addresses this massive underutilisation of that potential resource for the benefit of Australian Researchers.

- Collaboration with MinEX CRC National Drilling Initiative (NDI)

Earth Composition



AuScope

- The AuScope **Earth Composition and Evolution** component provides operational support for a world-class suite of analytical infrastructure.
- Facilities at Curtin, Macquarie and Melbourne Universities.
- National Geochemistry Network
- This system provides Australian Earth Scientists with critical geochronological and geochemical data necessary to understand the formation mechanisms and geological evolution of the Australian continent.

Earth Composition

Paradigm change for NGN

- Analytical innovation is producing multi-dimensional data sets at higher rates and in greater volumes (e.g., Split-stream LA-ICP-MS/MC-ICP-MS; U-Th/Pb + Hf + 32 elements - 30X more productive than ion probe); Geoscience Atom Probe with 250 million atoms!)
- ARC grant applications require data management, storage, access and re-use plans (descriptive now, prescriptive later). Australian governments taking a greater interest in creating open data environments for publicly-funded data.
- Federal and state geological surveys interested in creating nationally significant isotope geochemistry maps.
- Structural transition from scholarly metrics based on citing of publications to citing of publications and/or data (DataCite.org).
- Need to improve performance in converting data to publication (estimated that only 15-30% of data generated makes publication).

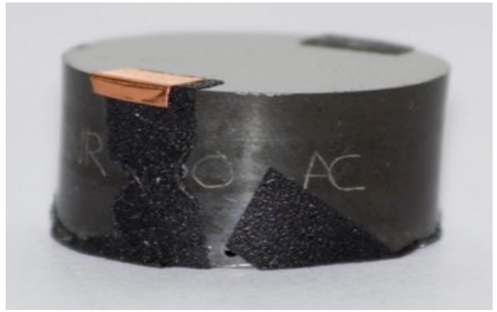
IGSN - Lims

IGSN: IECUR008F

IECUR008F.classification.png
(primary image)

IGSN: IECUR008F
Sample Name: 143784M
Other Name(s):
Sample Type: Rock Powder
Parent IGSN: IECUR001B

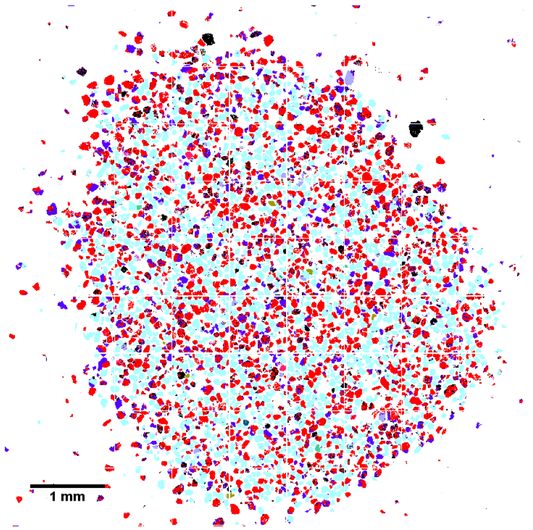
Description	
Material:	Rock
Classification:	Sedimentary>Siliciclastic
Field Name:	Dovers Hills
Description:	The sample is the magnetic separa
Age (min):	Not Provided
Age (max):	465 million years (Ma)
Collection Method:	surface collection
Collection Method Description:	Not Provided
Size:	Not Provided
Geological Age:	Permo-Carboniferous
Geological Unit:	Paterson Formation
Comment:	Not Provided
Purpose:	The maximum depositional age fo
Geolocation	
Latitude (WGS84):	-23.11865
Longitude (WGS84):	128.7915
Northing (m) (UTM NAD83):	7443330
Easting (m) (UTM NAD83):	478651
Zone:	52K
Vertical Datum:	NAVD88
Elevation:	456
Nav Type:	GPS
Physiographic Feature:	Hill
Name Of Physiographic Feature:	Dovers Hills
Location Description:	Gibson Desert North
Locality:	Dovers Hills
Locality Description:	This sample was collected from th Dovers Hills, and 1.7 km north of t
Country:	Australia
State/Province:	Western Australia
County:	Gibson Desert North
City:	Gibson Desert North
Collection	
Field Program/Cruise:	Geological Survey of Western Aust
Platform Type:	Not Provided



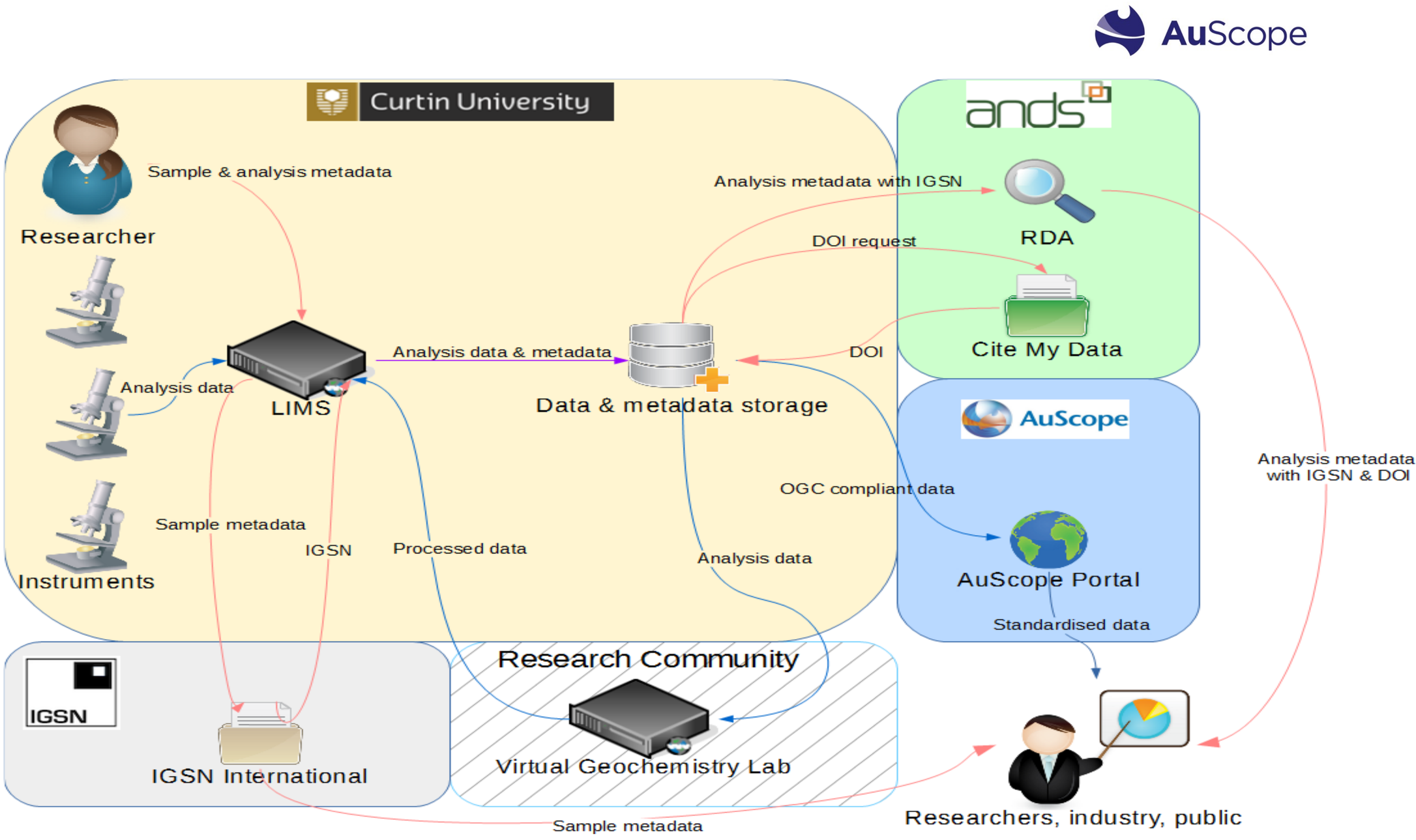
AuScope

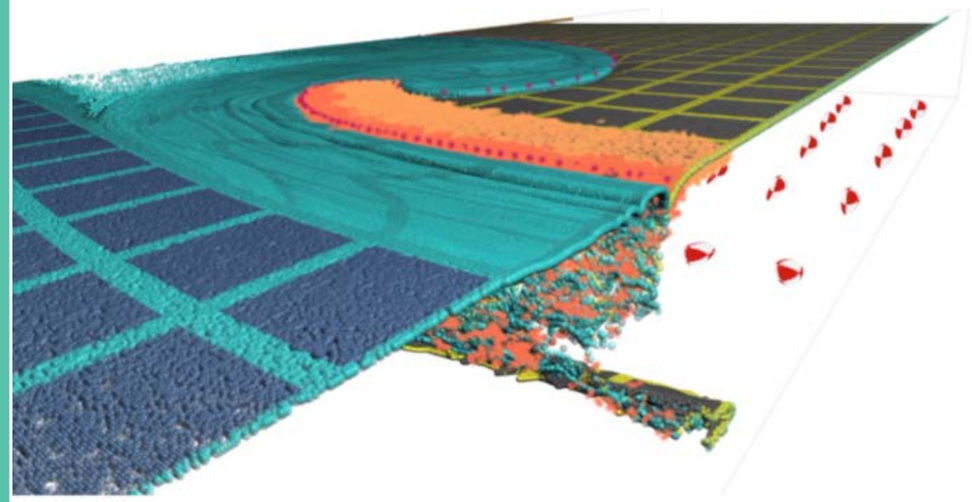
IGSN and LIMS

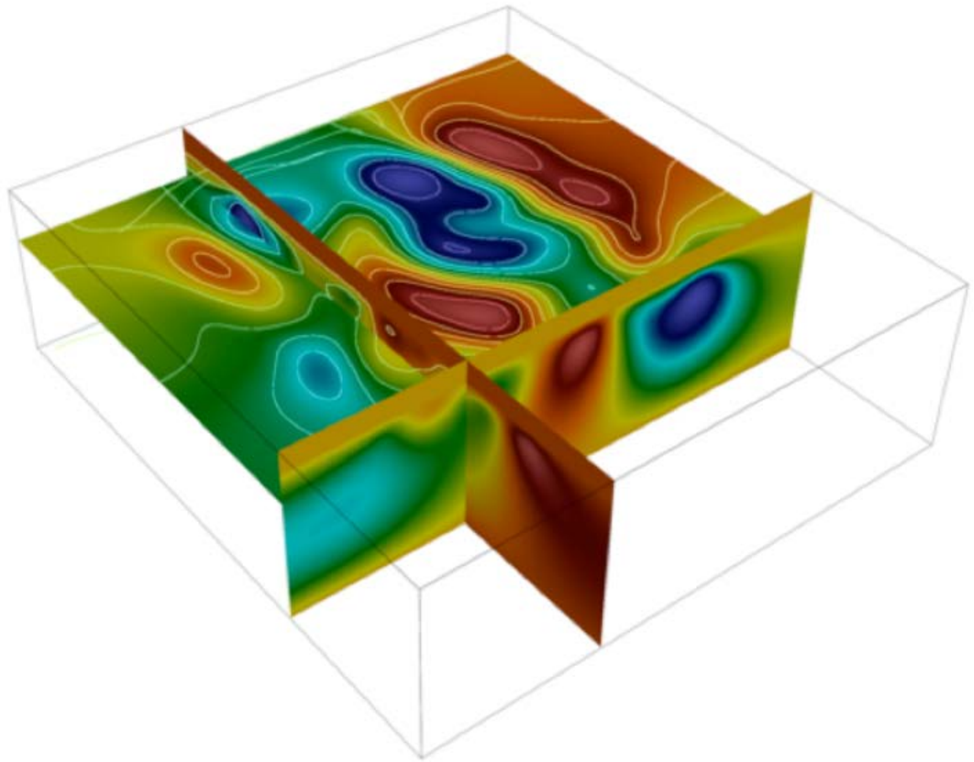
- IGSN is a unique alphanumeric code assigned to specimens and related sampling features to ensure their unique identification
- GA, CSIRO and Curtin/AuScope



IGSN - Lims


AuScope
Curtin University
Researcher
Sample & analysis metadata
Instruments
Analysis data
LIMS
Analysis data & metadata
Data & metadata storage
Sample metadata
IGSN
Processed data
Analysis data
ands
Analysis metadata with IGSN
RDA
DOI request
Cite My Data
DOI
AuScope
OGC compliant data
AuScope Portal
Standardised data
Analysis metadata with IGSN & DOI
IGSN
IGSN International
Research Community
Virtual Geochemistry Lab
Researchers, industry, public
Sample metadata





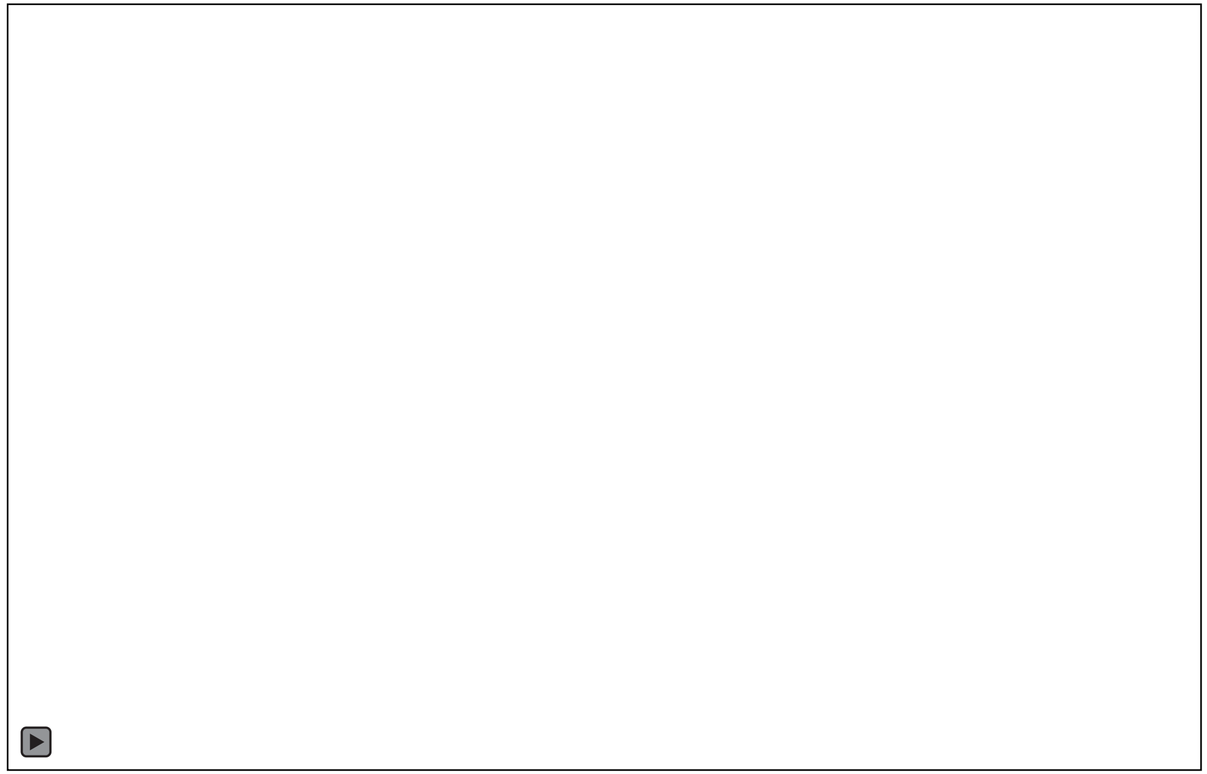
AuScope

- The **Simulation Analysis and Modelling or SAM** program delivers a digital toolkit for 3D and 4D modelling, simulation analysis and data mining for Australian Geoscientists.

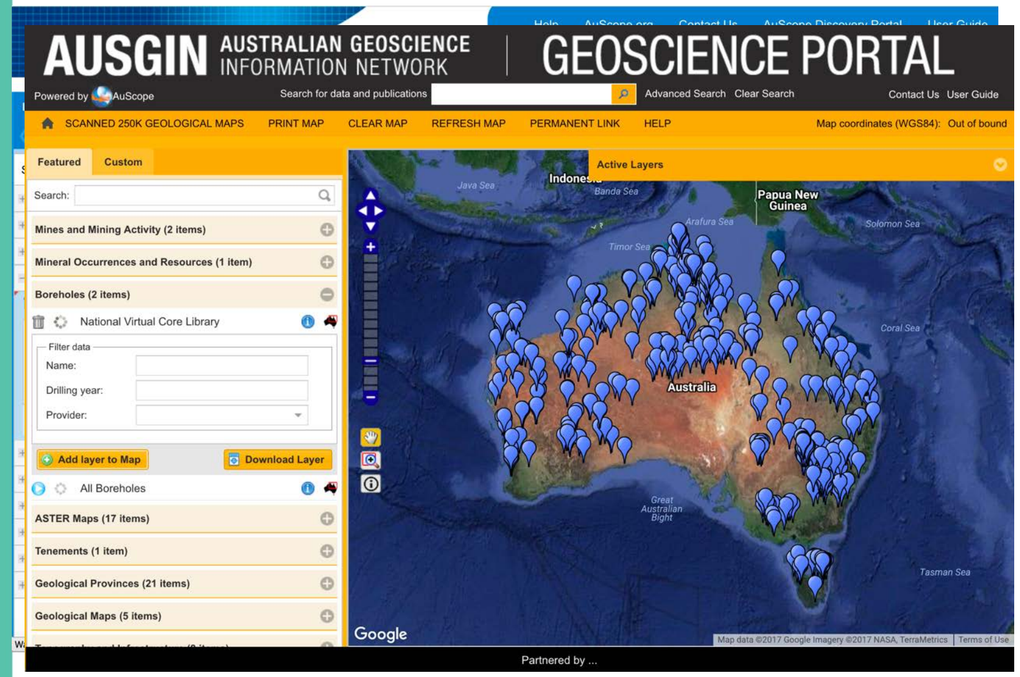
- New data assimilation workflows ensure these models are constrained by observational data collected using other AuScope research infrastructure.

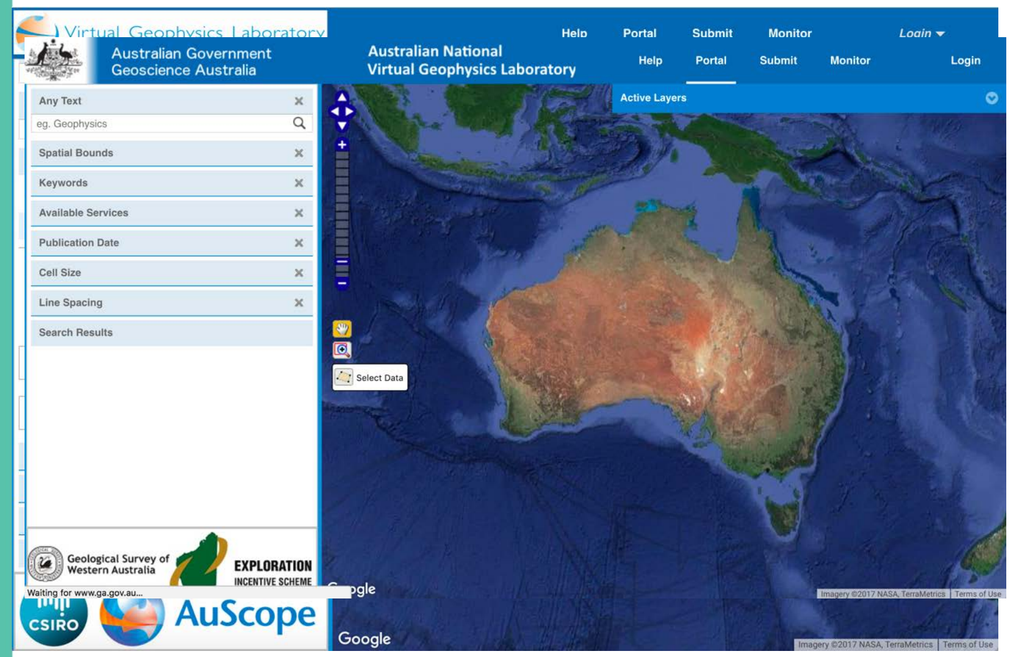
eResearch

AuScope



AuScope GRID





AuScope

- The **AuScope Portal**, the **Virtual Geophysical Laboratory** and the new **Data Enhanced Virtual Laboratory** provide access to data collected or generated by the AuScope National Infrastructure or in collaboration partner organisations.

- This data is freely accessible, findable and interoperable. New development related to the DEVL program will endure all data meets the requirements of the FAIR principles.

- “Data lakes” and E2SIP

Strategy

AuScope

ARDC
Australian Research Data Commons

CSIRO

Australian Government
Geoscience Australia

NCI

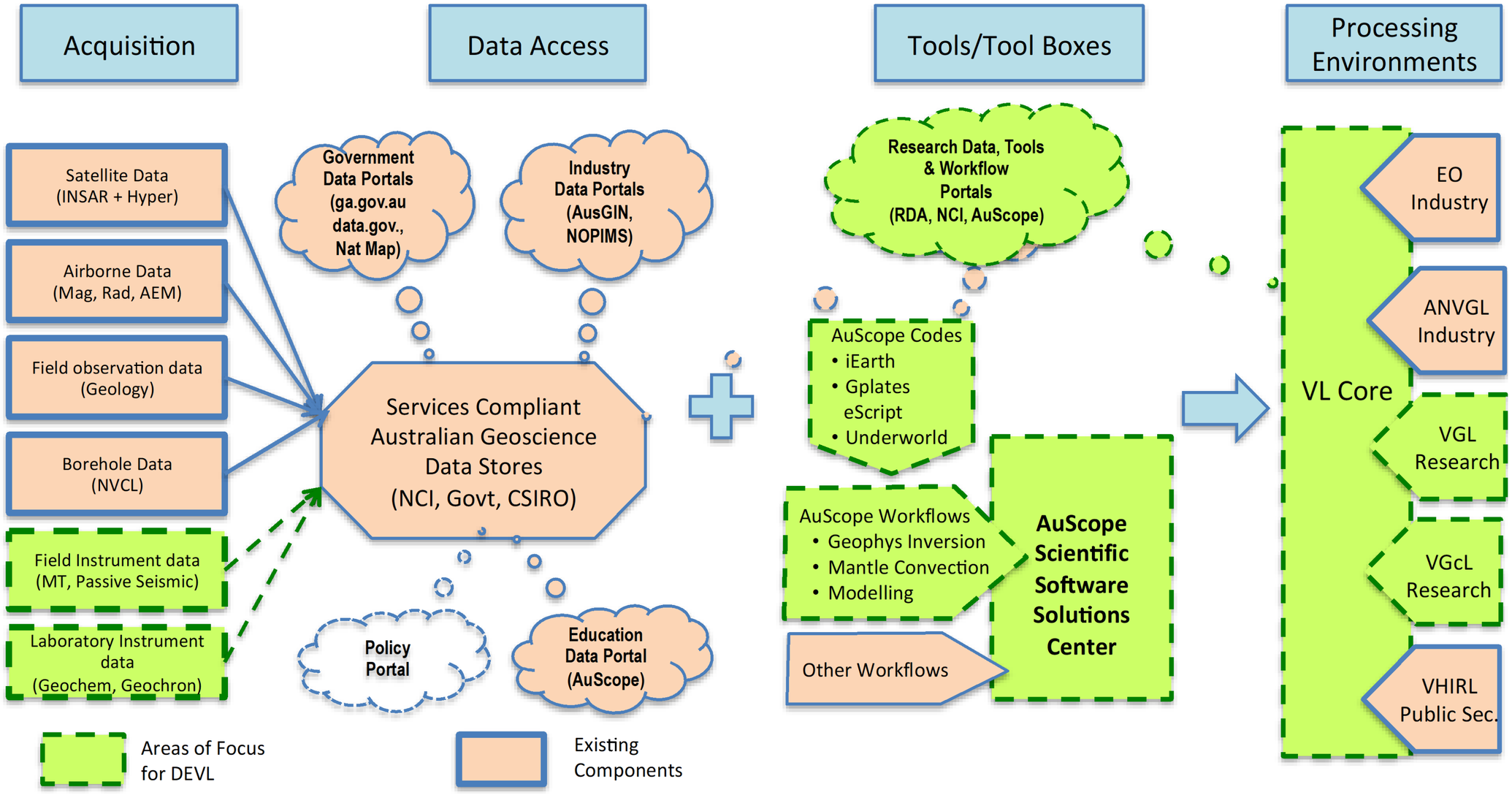
AuScope

Virtual Laboratories

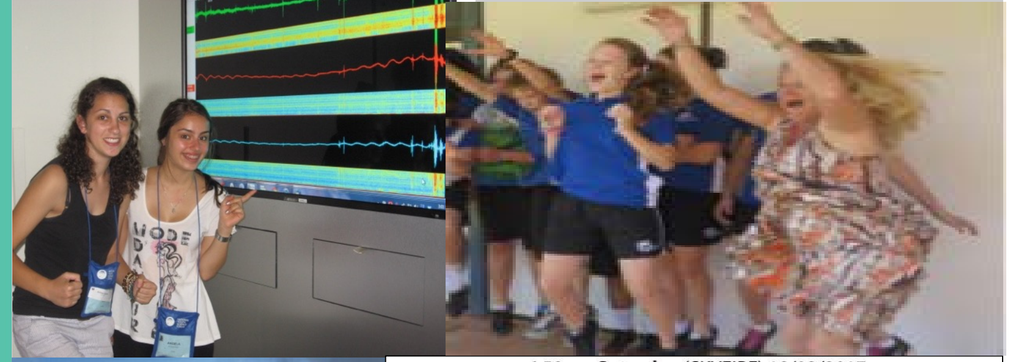
- Initially just linking data to computation
- VLs now instrumental in orchestrating workflows
- Scientific Software Solution Centre (SSSC) provides a registry for workflows that can be human and machine discoverable and more importantly executable on the fly
- Collaboration

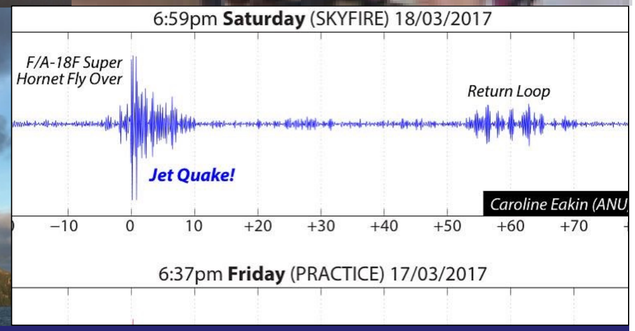
Strategy

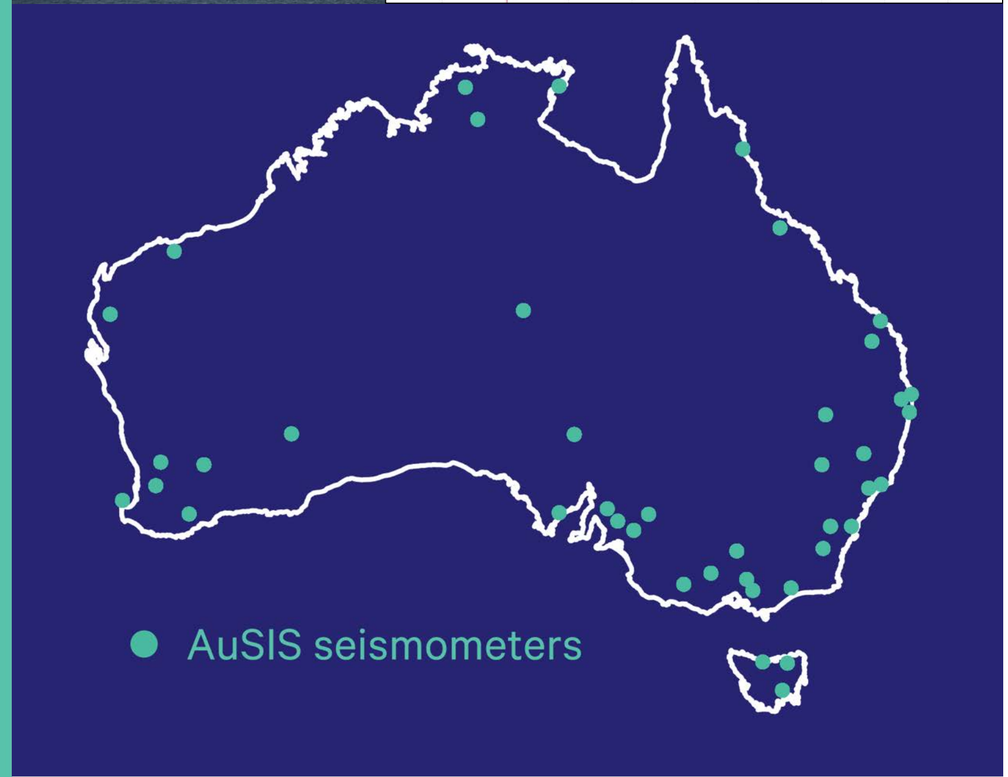
AuScope Data Enhanced Virtual Research Environment



Outreach – Seismometeres in Schools







AuScope

- The AuSIS Seismometers in School sand GPS in Schools programs place research quality instrumentation in secondary school classrooms across the country
- Provided resources engage students in the geosciences and data is QC’ed and included in National research collections

Get Involved

AuScope 2.0 - Opportunities

Strategy

National Innovation and Science Agenda

AuScope

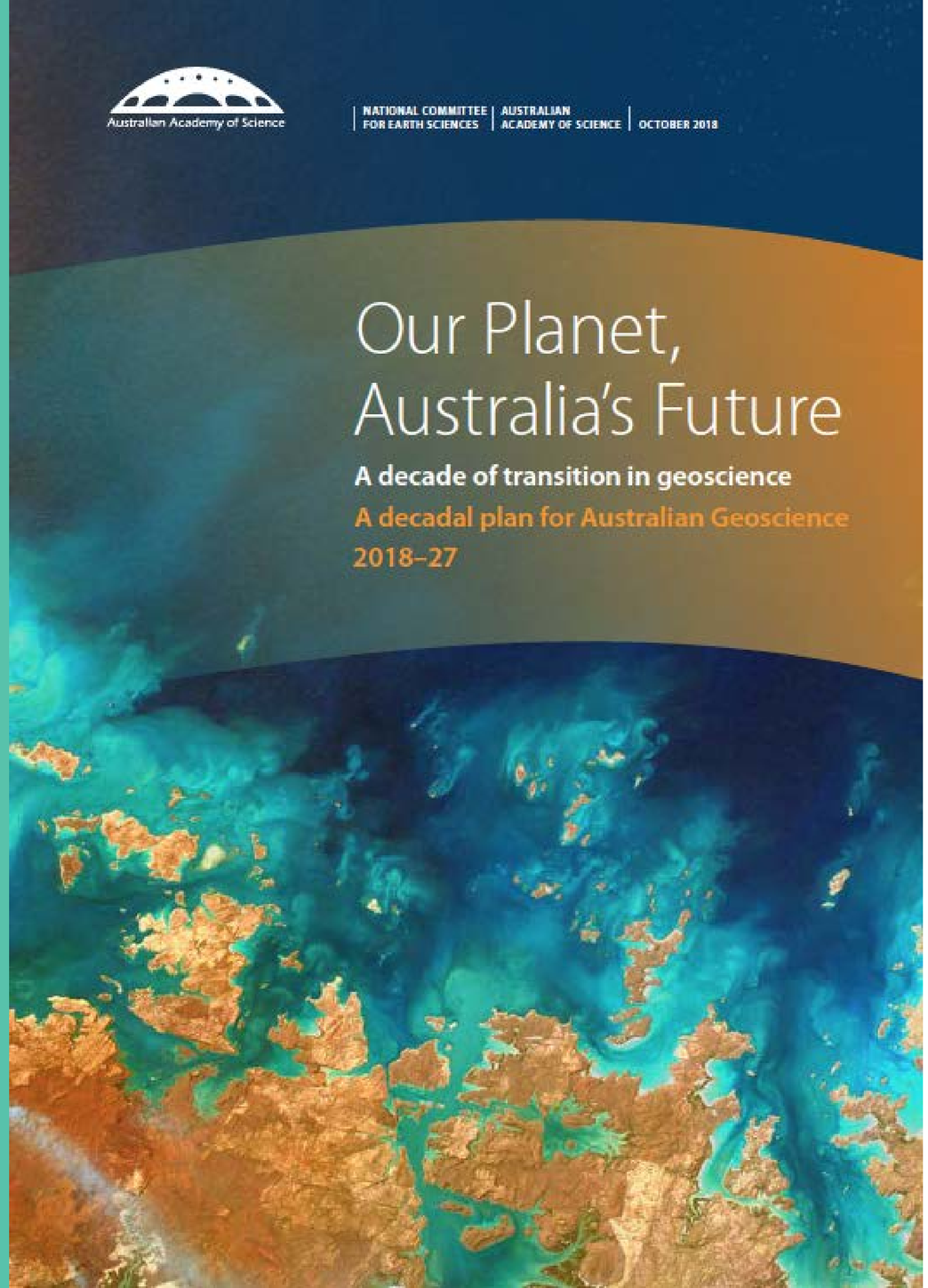
- $1.5B NISA commitment over 10 years
- Highlighted 9 research infrastructure focus areas

- 2018 Budget provides 5 years of operational funding security (~$40M) plus $1.5M new capital

- Significant new capital investment currently deferred beyond forward estimates

- Inward focused Earth monitoring and exploration
- Explore establishment of next generation Earth monitoring and potential development of inward looking “telescopes”
- *“generational shift in technology resources and interconnectivity of all facilities”*…including the establishment of a virtual laboratory network to enable sharing of large data (including digitised collections) and improved real time communication.

Decadal Plan



Key science challenges

AuScope

- Food and water sustainability
- *Australia's mineral resource future*
- Australia's energy future
- Geohazards

We must develop a predictive geoscience capability

- Research
- Infrastructure
  - Enhanced observational capability
  - Data
  - Computational capability
  - International collaboration
  - Cross-sector collaboration
  - Education
  - Advocacy

Building the downward looking telescope

AuScope

- The AuScope AEOS Strategy is to link field and laboratory infrastructure across Australia to form a sensor array focusing on the Solid Earth
- *"The AEOS will be our communities SQA – a distributed telescope that looks into the earth rather than away from it"*
- Providing unprecedented imaging fidelity of our crust to fundamental and applied researchers in the earth, environmental and geospatial sciences
- Collaboration with UNCOVER and MinExCRC
- Supported by NCES Decadal Plan

Future Investment

Future Focus

- NISA and the NRIR provides an enormous opportunity for AuScope and the geoscience community as a whole
- Possibility for significant new investment in national programs in support of research initiatives such as UNCOVER
- Building a *Downward looking earth telescope*
- AuScope is seeking community feedback regarding investment priorities over the coming decade

AuScope

Thank you

Connect with AuScope

auscope.org.au

auscope

auscope-limited

trawling@unimelb.edu.au