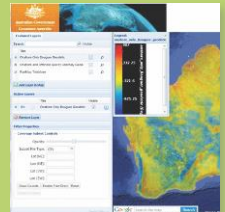
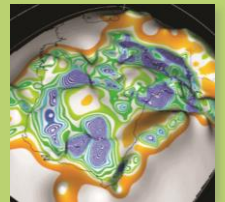


AuScope eResearch capacity and strategy

May 1 2017

Tim Rawling - AuScope
tim.rawling@unimelb.edu.au

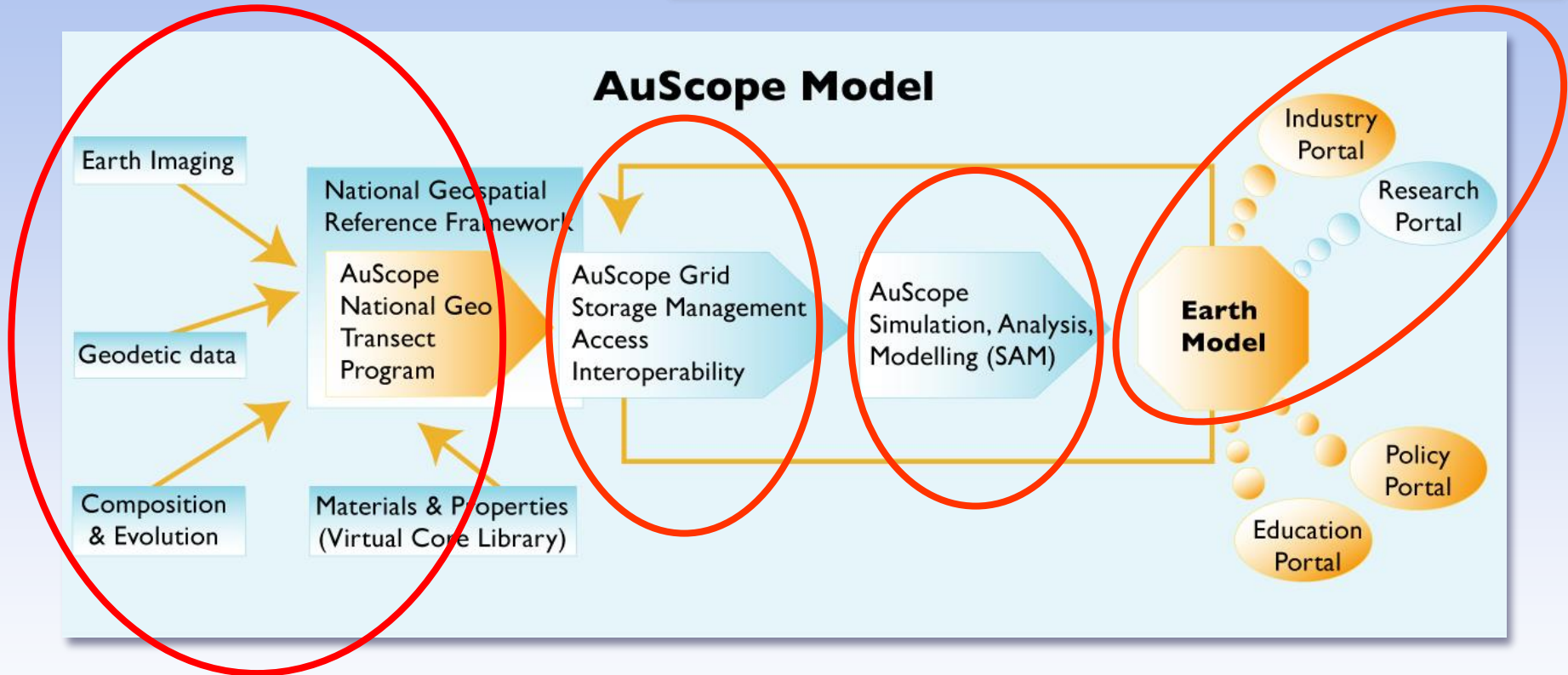


What is AuScope

- AuScope was established 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 – *“Australian Geophysical Observing System”*
- *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*

AuScope Infrastructure System for National Data and Integration

a combination of research infrastructure and applied science infrastructure



Physical equipment and datasets

National spatial framework

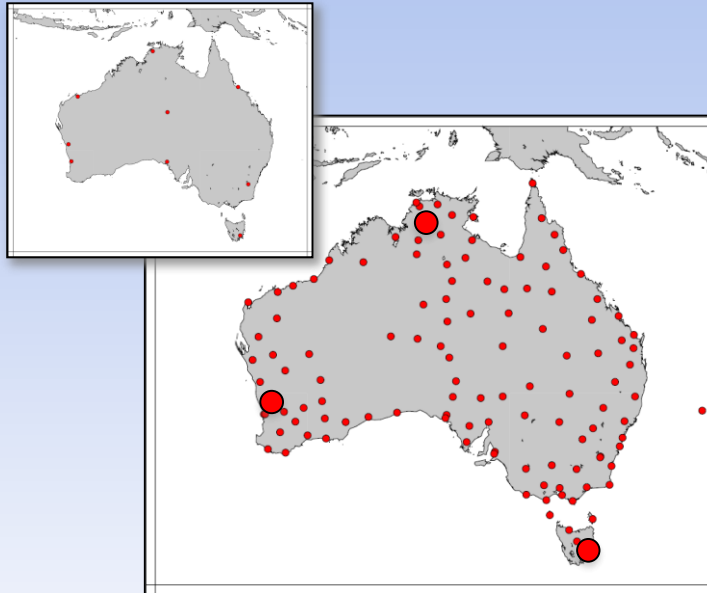
Grid computing infrastructure to access data

Software for analysis and modelling

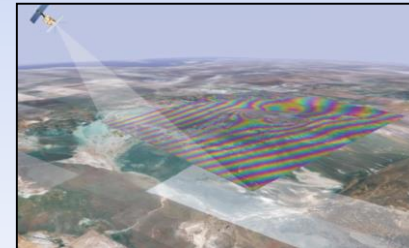
Models and concepts for the Australian Continent

AuScope Geospatial Capability – Geoscience Australia

AuScope NCRIS → AuScope AGOS



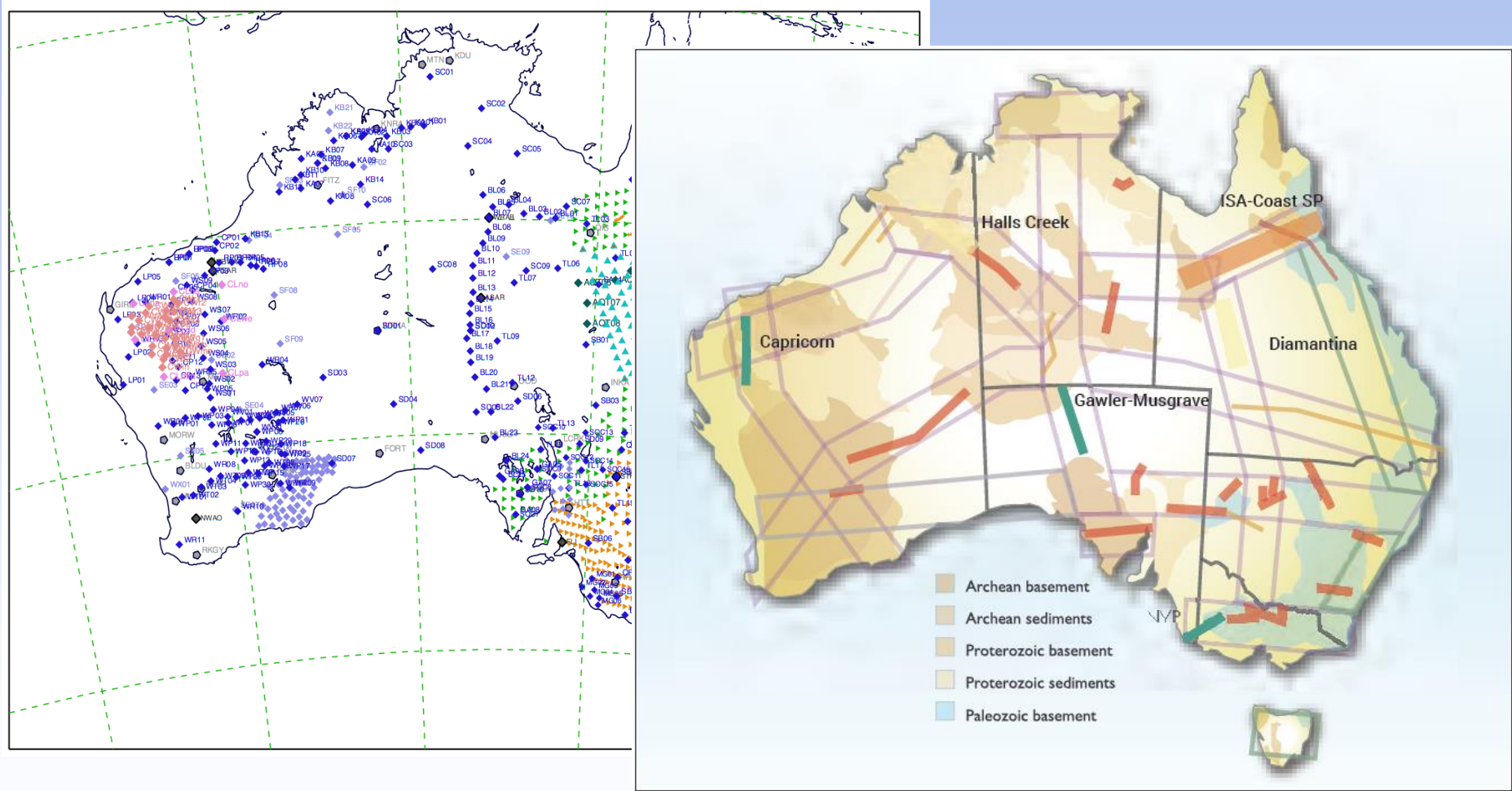
- VLBI instruments
- GNSS network
- Differential interferometry
- Gravity measurement
- Corner cube reflectors



Providing capability to see deep into the Earth



The largest transportable seismic array in the Southern Hemisphere



Integrated with >1400km of deep reflection seismic transects

Massive industry investment in underutilised infrastructure

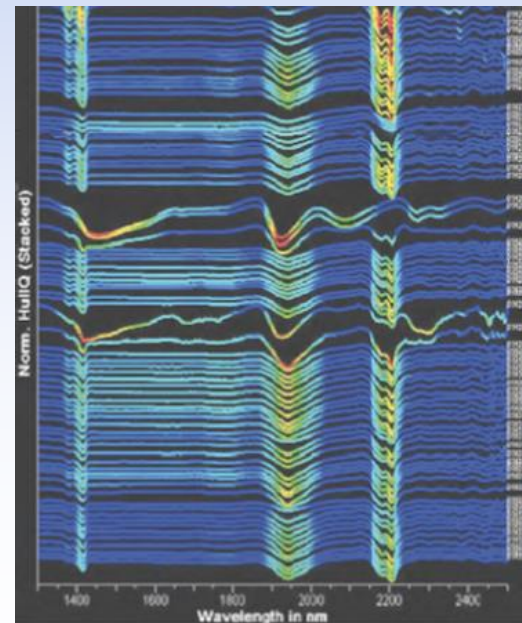


NVCL and HyLogger - CSIRO & GSO's

Oxide and hydrous silicates
+ anhydrous silicates

>900,000m of core from >2600 holes

212 publications & reports, 186
government uses, 195 commercial uses,
143 industry collaborations, and
numerous students.

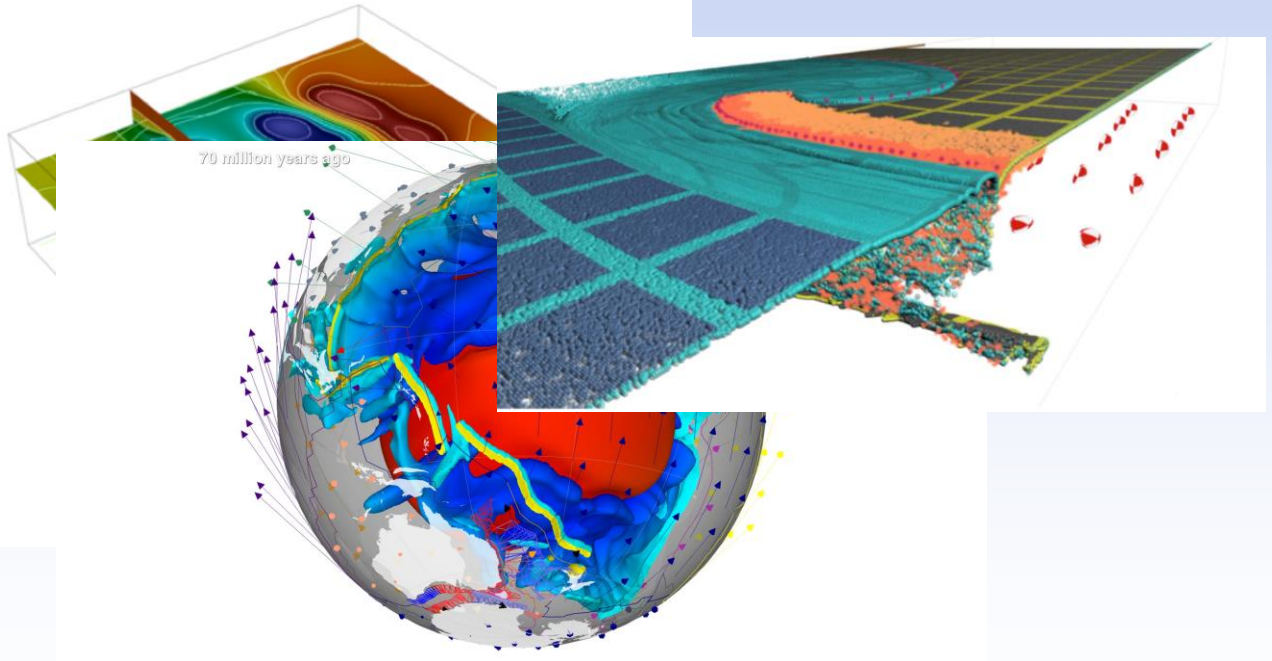


eResearch platforms and simulation modelling

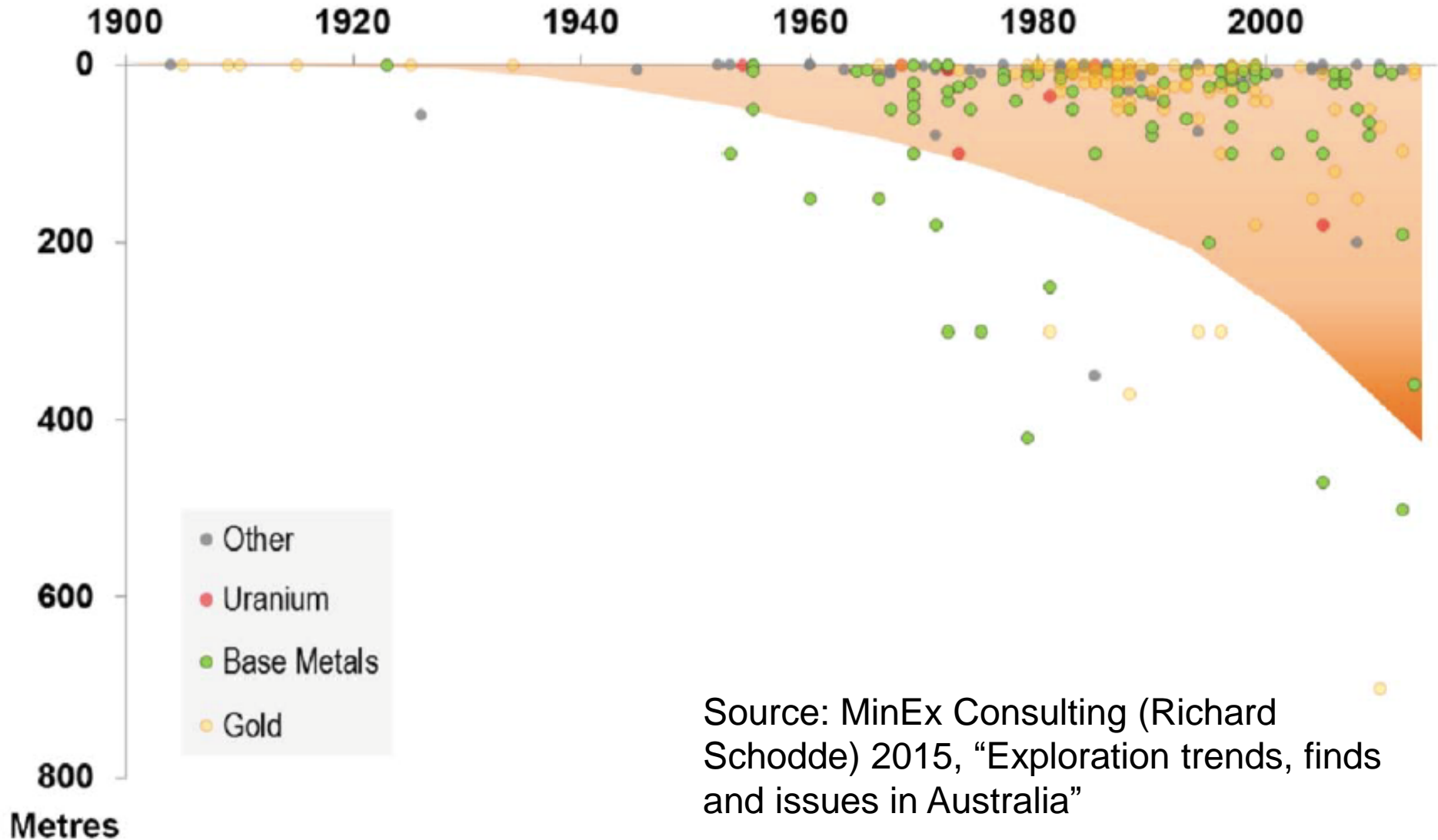


AuScope

Geoscience Australia



eResearch critical to drive exploration and reduce exploration risk



Oil Industry leading the way in the application of HPC/HPD techniques

Titan Class vessel




- Modern Seismic survey collect Terabytes of data per day
- On HPC it is possible to analyse 600 TB+ sized data sets
- There are now at least 5 Supercomputers dedicated to oil exploration in the latest Top 500 Supercomputer list
- There are none dedicated to Minerals Exploration
- As our sensor and other acquisition technologies improve (e.g., DET CRC) our data volumes will increase exponentially and full value will not be gained without a step change in how the data are stored, aggregated, and then processed.

Source:

http://www.cray.com/sites/default/files/resources/PGS%20SEG_HPC_forum_SBD-still.pdf?elqTrackId=4ABC727EC1D9B9AA4D5AB2D2AF250EAA&elqaid=375&elqat=2

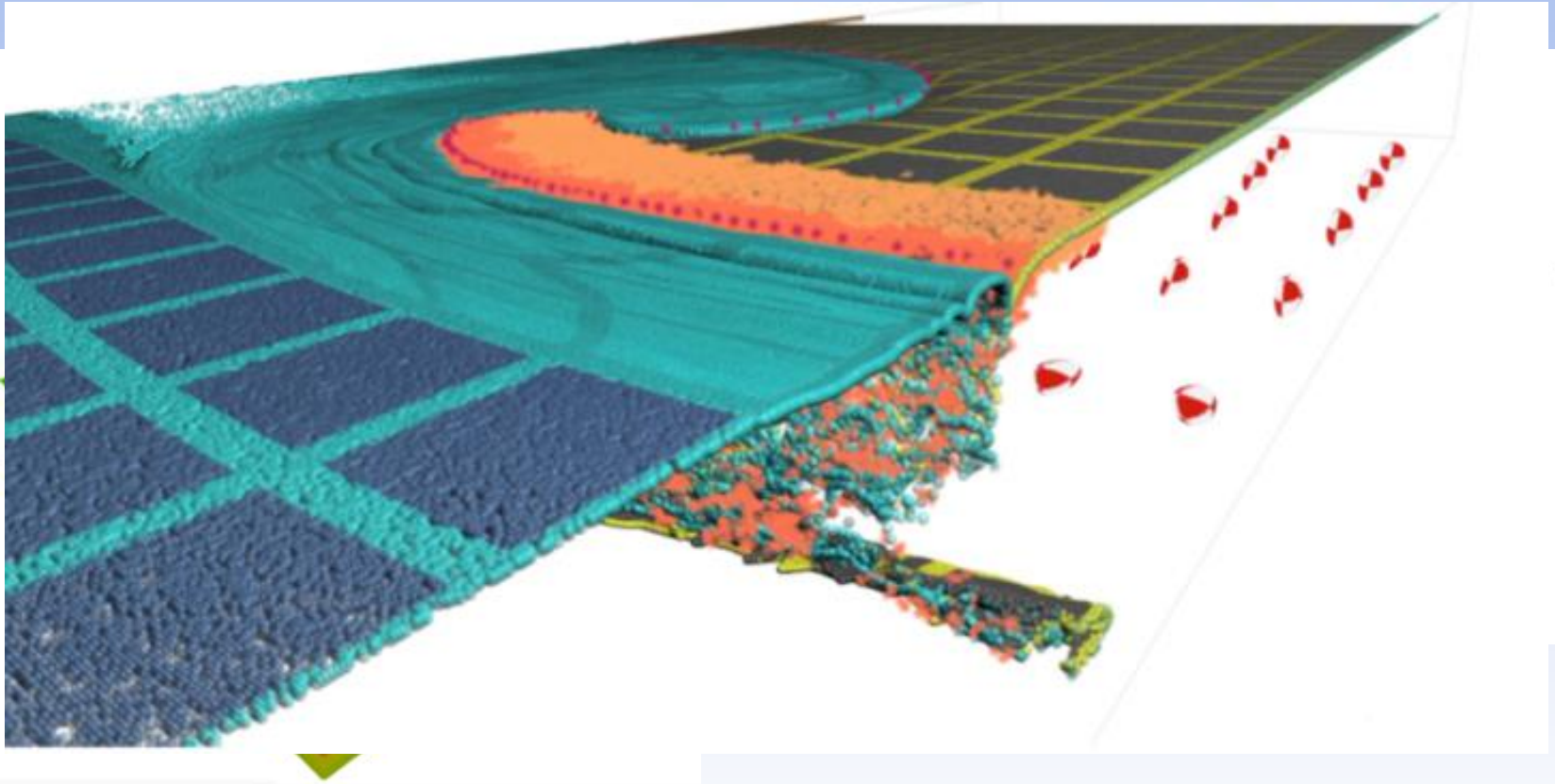
Australia is awash with Geoscience data of relevance to Minerals Exploration

- But it is fragmented, hard to find and access, is often locked in proprietary formats and is rarely aggregated into modern self describing formats for Data-intensive analysis.
 - Current computational infrastructures utilised by industry mean that the data have to be averaged, subsetting, downsampled, degraded etc.
 - This means that we are not using our vast data assets to resolutions that the data are collected.
 - Multi-disciplinary analysis and integration of data sets is difficult, if not possible.
- 

The three steps required to transform Minerals Exploration to utilise the next generation computation and data infrastructures

1. New tools and applications that operate in massively parallel HPC environments
 - this is what the AuScope SAM has been developing
2. Cohesive, value-added, nationally calibrated data sets that can be accessed within realistic time frames
 - this is what NCI and GA have been developing
3. Creating online virtual laboratories that allow seamless access to distributed data, software and computer services and can also automatically generate provenance workflows to enable all aspects of scientific process to be automatically captured
 - this is what CSIRO, NCI, GA and others have been developing with support from Nectar

Parallelised software



Inversion of gravity anomaly data

<http://www.iearth.org.au/codes/Escript-downunder/>

Underworld particle in cell FEM – simulation of fluid dynamics and plate motion
www.underworldcode.org

Collaboration: Laboratory Information Management Systems – ANDS-Nectar



Problem:
Non-unique sample numbers create chaos



[Scan](#) QR Code

Solution: Automate assignment of International Geo Sample Number (IGSN) to analysis.

The Digital Mineral Library at Curtin University

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 separation
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 for

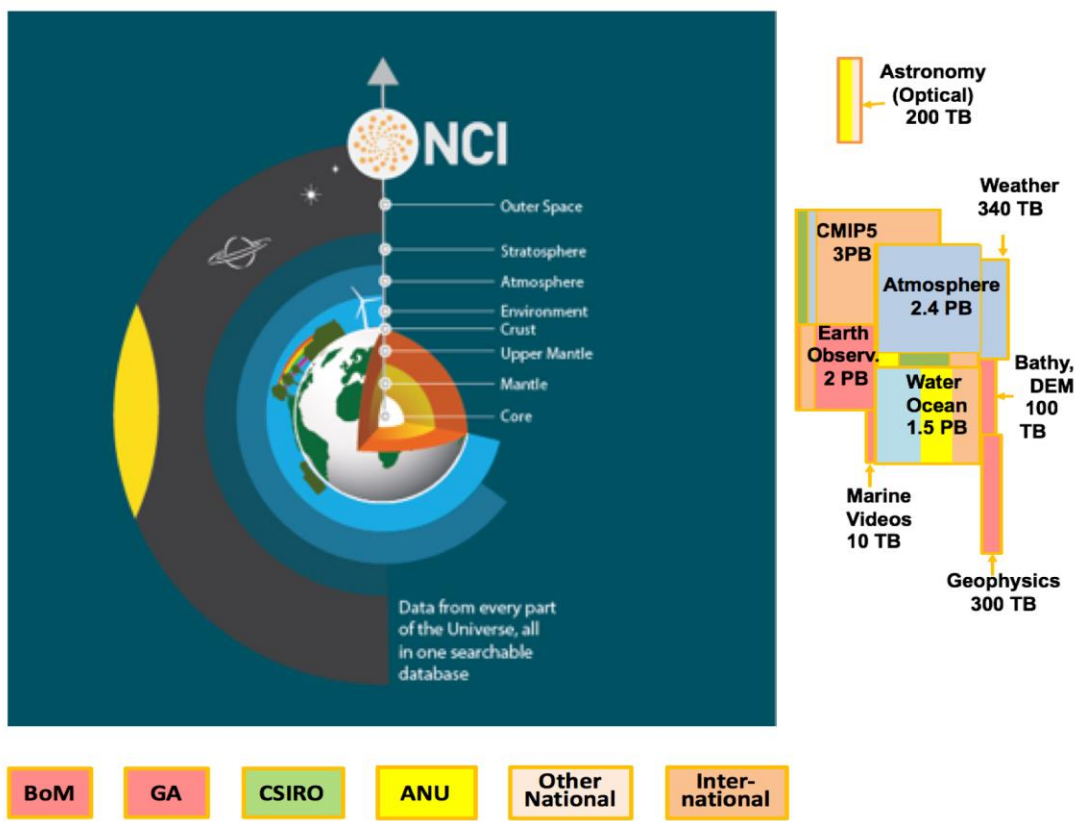
Geolocation

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 the Dovers Hills, and 1.7 km north of the
Country: Australia
State/Province: Western Australia
County: Gibson Desert North
City: Gibson Desert North

Collection

Field Program/Cruise: Geological Survey of Western Australia
Platform Type: Not Provided

Collaboration: Data and compute at NCI



1. NCI was supported by RDSI funds to build a **10+ Pbyte** National Environment Research Data Collection

<http://geonetwork.nci.org.au.au>

2. The Geoscience collection at NCI includes:

- Gravity (1.57 million points)
- Magnetics (34 million line-km)
- Radiometrics
- Seismic
- Magnetotellurics
- Airborne Electromagnetics (AEM)
- Satellite data (Landsat, MODIS, ASTER)
- Geology (1:1M)
- 3D models
- Topography (LiDAR, SRTM)

Collaboration: Virtual Laboratories – NeCTAR – CSIRO – GA

AuScope
AN ORGANISATION FOR A NATIONAL
EARTH SCIENCE INFRASTRUCTURE PROGRAM

Help AuScope.org Contact Us AuScope Discovery Portal User Guide

Map coordinates (WGS84 decimal degrees): Out of bound [Permanent Link](#)

Layers

Featured Registered Custom Research

Search: View by

- * AuScope Earth Resource Services (4 Items)
- * Tenements (2 Items)
- * Northern Yilgarn Hydrogeochemistry (1 Item)
- * JdLC Mineralogy Library (1 Item)
- * Chile Region IV ASTER Map (4 Items)
- * Geological Survey of Western Australia (11 Items)
- * Others (4 Items)
- * Boreholes (4 Items)
- * National ASTER Map of Australia (17 Items)
- * Magnetics (5 Items)

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**Australian Government
Geoscience Australia**

Any Text

eg. Geophysics

Spatial Bounds

Keywords

Available Services

Publication Date

Cell Size

Line Spacing

Search Results

**Australian National
Virtual Geophysics Laboratory**

Help Portal Submit Monitor Login

Active Layers

Base Layer

- Google Satellite
- Google Streets
- Google Physical

Select Data

Geological Survey of Western Australia

EXPLORATION
INCENTIVE SCHEME

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ANVGL

**Virtual Geophysics
Laboratory (VGL)**

The Australian Earth Observing System – infrastructure Roadmap and strategic review



Timeline

2011 Roadmap

2014-15 Strategic Review

2015-16 Community engagement

Key Science Themes

Temporal Architecture

Changes and Impacts

Science Enablers

Assessment Criteria

Australian Earth Observing System: providing a strategic suite of investment opportunities



The AEOS will be our communities SOA - a distributed telescope that looks into the earth rather than away from it

Providing datasets that serve the geoscience, geospatial, environmental and climate science communities

Providing unprecedented imaging fidelity serving the earth from small and applied scales across all scales researchers in the earth,

Providing an integrated geospatial science

Providing on instruments, data management and delivery

Strongly aligned with other, community strategic initiatives including the UNCOVER and discovery and delivery program

**AuScope
Grid and
Interoperability**

**Earth
Composition
and
Evolution**

**Australian
Geophysical
Observing
System
(AGOS)**

**National
Virtual
Core Library
(NVCL)**

**Earth
Imaging
and
Structure**

**Simulation,
Analysis,
Modelling
(SAM)**

**Geospatial
Framework
and Earth
Dynamics**

**AuScope - world class research infrastructure
as a framework for understanding the structure,
evolution and dynamic processes of the
Australian continent in space and time.**

tim.rawling@unimelb.edu.au

AN ORGANISATION FOR A NATIONAL EARTH SCIENCE INFRASTRUCTURE PROGRAM