

# Groundwater

THEME COORDINATOR:  
Ken Lawrie

The AESC brings together 40 presentations that cover many aspects of Groundwater as part of a full program on Uncover Earth's Past to Discover Our Future. Groundwater forms a significant part of the 2016 AESC, and covers topics relating groundwater to the environment, mineral exploration, mining, and unconventional energy.

360 papers and 135 posters will be presented over the four days of the conference from June 26 – June 30. Presentations come from Australasian university students and researchers, Australasian government organisations including Geoscience Australia, and CSIRO, and leading industry explorers, miners and their service companies.



**PHOTO:** Pleistocene sediments of the Hindmarsh Clay (red) and unconformably overlying Bridgewater Formation (white) in cliff exposures at Balgowan, Yorke Peninsula, South Australia. Photo courtesy of Caroline Forbes

**Mineral Endowment:**

Formation and Exploration of Mineral Deposit; Their Tectonic and Geochemical Environment and Significance

**Earth's Environment:**

Past to Present

**Tectonics of the Planet:**

Craton and Continental Formation and Evolution, Ocean Plate Tectonics, Plate Margin and Plate Interior Tectonism

**Deep Earth Geodynamics:**

Core, Asthenosphere and Lithosphere Dynamics, Coupling the Dynamic Deep Earth with Surface Tectonics

**Geoscience and Society**

Education, Integration and Translation of Earth Sciences for Societal Benefit

**Earth Science**

**for Energy:**  
From Hydrocarbons to Renewables

**SYMPOSIA**

**The 40th Anniversary of Olympic Dam Symposium**

**UNCOVER Symposium:**

The future of under cover exploration

**AuScope 10 Year Anniversary Symposium**

**Early-Mid Career Geoscientist Symposium**

**Sprigg Symposium:**

Earth's Evolving Climate



## Groundwater and Environment – past and future

This session will explore future climate impacts on groundwater systems, as well as those that advance the understanding of 'fossil' groundwater systems.

The relationship of these investigations to groundwater management will be addressed.

### KEYNOTE

**Prachi Dixon-Jain:**

Groundwater resource vulnerability assessments in SW Pacific Island nations: Identifying communities at risk, and climate change adaptation strategies

**Ken Lawrie:**

Netotectonic controls on Australia's surface and groundwater systems

**Michael Friedel:**

Smart aquifer characterization and mapping with machine-learning and evolutionary techniques

**Axel Suckow:**

Deep systems and old groundwater: new noble gas tools and a shift in paradigms for interpreting established tracers

**Michael Short:**

Tracing salt cycling in a small endorheic basin using chloride/bromide ratios and stable halogen isotopes

**Tim Ransley:**

The Great Artesian Basin - mapping the basin architecture and variations in water chemistry

**Zhuheng Hu:**

Hydroclimate responses to increases in greenhouse gas concentrations and land use and land cover changes

**HanCheng Lu:**

Influence of bimodal vertical wind shear on typhoon structure and intensity

## Groundwater in mineral exploration and mining

This session will highlight the use of novel techniques, including hydrochemical methods, in mineral exploration, and present research into the impact of mining on groundwater systems (groundwater flow, groundwater contamination and remediation, and subsidence).

### KEYNOTE

**David Gray:**

Hydrogeochemistry in Australia: Challenges and Possibilities

**Tim Munday:**

Working with the minerals industry in facilitating outback water solutions for remote parts of South Australia - The Goyder Long-Term Outback Water Solutions (G-FLOWS) Eyre Peninsula Project.

**Nathan Reid:**

Can drilling fluids be used as a mineral exploration sampling medium?

**Robert Thorne:**

Regional hydrogeochemistry of the Capricorn Orogen, Western Australia

**Tim Munday:**

Uncovering the groundwater resource potential of Murchison Region of Western Australia through targeted application of airborne electromagnetics

**Ian Brandes de Roos:**

Sedimentary basins for geothermal energy: the Montgomery House example



Australian Government  
Geoscience Australia



**AESC**  
australian earth sciences  
convention



## Groundwater and Unconventional Energy

This session will explore new insights into the hydrogeology of groundwater systems related to coal seam gas, shale resources, CO<sub>2</sub> geosequestration and geothermal energy. It will encompass the hydrostratigraphy, tectonics, hydrochemistry and hydrodynamics of such systems. The session will examine the evidence for groundwater processes including inter-aquifer leakage, the recognition of natural fugitive emission zones, and the potential for near-surface impacts.

### KEYNOTE

**Steven Lewis:**

BA foundations rock!  
How geoscience underpins  
the bioregional assessments

**Andrew Moster:**

CSG in the GAB –  
changing our  
understanding of  
basin hydrodynamics

**Ian Brandes de Roos:**

Sedimentary basins for  
geothermal energy: the  
Montgomery House example

**Yohannes Didana:**

Magnetotelluric monitoring  
of hydraulic fracture  
stimulation at the Habanero  
Enhanced Geothermal  
System, Cooper Basin,  
South Australia

**Axel Suckow:**

A multi-tracer study reveals  
the Hutton Sandstone aquifer  
as a double porosity  
system

**Matthias Raiber:**

Integrated geological,  
hydrogeological and  
groundwater modelling  
assessment of potential  
impacts of coal seam  
gas activities: an example  
from the Clarence-Moreton  
bioregion

**Sam Matthews:**

Tracking CO<sub>2</sub>  
geosequestration using  
downhole gravity gradiometry,  
Otway Basin, Victoria,  
Australia

## New developments in groundwater and environmental mapping, characterisation, assessment and modelling

New approaches and technologies for the rapid cost-effective, mapping, characterisation, monitoring and visualisation of complex natural hydrological (surface and groundwater) systems are currently being developed. This session will investigate advances in the use of remote sensing technologies and advanced computational capa-

bilities for mapping surface and groundwater systems; advances in the use of geophysical and hydrogeophysical techniques; new hydrochemical and hydrodynamic methods and technologies for the characterisation of groundwater systems, aquitards and aquifers; and advances in the modelling of groundwater systems.

### KEYNOTE

**Adam Lewis:** The Australian Geoscience Data Cube:  
Transforming our ability to map and monitor the land  
surface with petabytes of Earth observation data

**Ross Brodie:** Developing and testing hydrogeological  
conceptual models – some key learnings from the  
Broken Hill Managed Aquifer Recharge (BHMAR) project

**Mark Keppel:**

A hydrochemical  
characterisation of  
aquifers and springs near  
Lake Blanche, Lake Eyre  
Basin, South Australia

**Graham Heinson:**

Electrokinetic monitoring  
of groundwater flow in  
fractured rock media

**Robert Andrew:**

Estimation of GRACE  
water storage components  
by temporal decomposition

**Irina Emelyanova:**

Determining porosity-  
permeability relationships  
from core plugs for aquitard  
formations in the Gunnedah  
Basin, Australia

**Lutz Gross:**

Large-scale 3D resistivity  
inversion of subsurface fluid  
injection monitoring data  
using adjoint state methods

**Tim Evans:**

Unravelling the enigmatic  
Galilee Basin, insights  
from geological modelling  
for the Galilee Bioregional  
Assessment





## SPEAKERS:

### KEN McCLAY

(Royal Holloway University of London):  
Thick and thin-skinned contraction –  
Inversion in orogenic systems.

### PAUL HOFFMAN

(Harvard University): Dates and dynamics –  
Snowball Earth comes of age

### RICHARD GOLDFARB

(Colorado School of Mines; China School of Geosciences,  
Beijing): Gold deposits in metamorphic rocks: Why are we  
getting more confused?

### SANDY STEACY

(University of Adelaide): Forecasting  
of tectonic and induced earthquakes

## FIELDTRIPS AND WORKSHOPS:

A variety of pre-, mid- and post-conference field trips are also scheduled with the conference

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