



The Queensland Geologist

Bi-monthly Newsletter of the Geological Society of Australia Inc. Queensland Division
Volume 108 No. 1 – February/March 2008

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GSAQ TALKS SUSPENDED TO 2008:

Wednesday 20th February 2008: **GSAQ Seminar**

Topic: CO₂ and Flue Gas Geosequestration in Surat and Bowen Basin Coals with Enhanced Coal Bed Methane (ECBM)
Speaker: Associate Professor Sue Golding, The University of Queensland
Where: University of Queensland, Steele Building, Room 221
Time: 5:15 for 6pm; finger food and drinks
Cost: **Free**

Abstract:

The reduction of CO₂ emissions from fossil energy sources is a possible step towards mitigating climate change. A key option is the capture of CO₂ from power plants and other large CO₂ point sources, and its storage in suitable geological formations. The most cost-effective storage formations are considered to be current oil and gas fields and deep coal seams where methane extraction is underway. Of potential significance is the injection of the whole flue gas stream, avoiding the high costs of separating and concentrating the CO₂. In this context, the sequestration of CO₂ or flue gas from Queensland power plants into coal seams is receiving increasing R&D attention. The utilisation of coal for CO₂ or flue gas storage could result in considerable amounts of enhanced coalbed methane (ECBM) that can pay for a large portion of the sequestration costs. Injection into the Surat Basin coals would yield a higher storage ratio and lower injection pressures, thus more energy efficiency than injection into the deeper Bowen Basin coals. This seminar will explore these potential advantages and the geochemical issues of CO₂-coal-water interactions.

Brief Biography: Associate Professor Sue Golding has been involved with resource geology and stable isotope geochemistry research since 1977, following some 8 years industry experience in Australia and Africa. She is currently Reader in Economic Geology and Manager of the Stable Isotope Geochemistry Laboratory at the University of Queensland. An important new research direction in the last ten years is in the area of energy and environmental technologies for the coal bed methane and coal mining industries, which rely on the use of natural isotopic tracers to understand geochemical and hydrochemical processes. In addition, Golding has a long standing interest in the early Earth carbon and sulfur cycles and is currently using stable isotope records in ancient sedimentary rocks and hydrothermal systems to establish the origin of different microbial metabolisms and their role in geochemical changes in the rock record through time.

Tuesday 18th March 2008: **AK Denmead Lecture**

Topic: Albitite-hosted uranium deposits in Queensland, Australia: The Valhalla Example
Speaker: Dr Paul Polito, Anglo American
Where: The Theodore Club, 333 Adelaide St, Brisbane
Time: 5:15 for 6pm; finger food and drinks
Cost: **Free**

Abstract:

The Valhalla uranium deposit is located 40 km north of Mount Isa, in the Mt Isa basin. It is one of 107 known uranium occurrences that have been recorded in Palaeoproterozoic metasediments and mafic volcanic rocks belonging to the Leichhardt River Fault Trough. Valhalla was discovered by prospectors in 1954 and has since been mapped and drilled by government geologists and at least 4 different companies seeking to define a minable U reserve in the Mt Isa district.

Mineralization occurs in foliated and brecciated albite, Mg-reibeckite (amphibole), calcite and (titano)magnetite dominated rocks (albitite). The foliated rock contains variable, but generally low concentrations of U in the form of finely disseminated brannerite. Economic mineralisation (nominally $\geq 0.1\%$ U_3O_8) occurs in the brecciated rock where brannerite, apatite, zircon, uraninite and anatase occur in addition to albite, reibeckite and calcite. Traces of red hematite are finely disseminated through out this assemblage and lend a distinct colour to the alteration. The brannerite occurs as fine disseminations and randomly orientated 10 to 200 micron elongate laths and likely sourced its Ti and Fe from detrital titanomagnetite. The reibeckite is commonly zoned and contains elevated F and V_2O_3 concentrations up to 3600 and 2600 ppm respectively. Calcite and much less dolomite are cogenetic with the reibeckite and albite. Apatite and hydrothermal zircon primarily occur where U grades are highest. The zircon occurs as sub-rounded grains, sub-hedral grains and 100 to 500 micron wide veinlets. Backscatter electron images show that most of the zircon is heterogeneous, with coalescing bright and dull areas. Electron microprobe analyses reveal that the brightest zircon areas contain up to 20.4 wt. % UO_2 whereas the dull areas contain as little as 2.9 wt. % UO_2 . This mineral is uranoan-zircon. The zircon veinlets are further characterised by 1 to 3 μm inclusions of PbS and CuS.

A late stage of mineralisation exists and comprises uraninite, red and steely grey hematite, dolomite, calcite, chlorite, quartz and Pb-, Fe-, Cu-sulfides. This mineralisation lacks brannerite. Electron microprobe images and analysis show that the uraninite is heterogeneous and is commonly observed being replaced by U-silicates. Late dolomite forms veins and may co-exist with chlorite, minor quartz and uraninite. Sulfides, other than pyrite and galena are rare, late in relation to most other alteration minerals and include chalcopyrite, bornite and sphalerite. This assemblage occupies <5% of the 93 m of drill core examined.

Whole rock geochemical data compiled from samples collected during this study plus data downloaded from Geoscience Australia's OZCHEM database was lithogeochemically assessed using Pearce Element Ratio (PER) analysis and General Element Ratio (GER) analysis. The PER and GER plots indicate that all of the samples investigated were either siltstones or fine-grained arenites/quartzites. Thin sections of least altered samples show that fine-grained sandstones occur in the footwall and hanging wall to mineralization. Non-mineralised samples have geochemical compositions that indicate that K-feldspar may have been a significant detrital component in the original sediment, but muscovite is now the dominant K-bearing phase in these samples. Mineralised samples contain minimal K, Ba and Si and elevated Na. The PER plots model K removal during the U mineralization process whereas Na was introduced. GER diagrams demonstrate that U, V, Zr, P, Sr, Y, Na and Ca were added at the same time that K, Si and Ba were removed.

Fourteen brannerite laths analysed by LA-HR-ICPMS have $^{207}Pb/^{206}Pb$ ages that range from 584 ± 6 Ma to 1543 ± 15 Ma. In contrast, mottled uraninite veins analysed by LA-HR-ICPMS have $^{207}Pb/^{206}Pb$ ages that range from 344 ± 3 Ma to 1220 ± 12 Ma. Mg-reibeckite separates extracted from drill hole DDH V39 were analyzed using the $^{40}Ar/^{39}Ar$ laser-heating technique. One reibeckite separate gives a total fusion Ar age of 1479 ± 10 Ma, identical to several fusion ages in the southern Mt Isa basin. A second reibeckite separate preserves a multiple step age of 1533 ± 9 Ma. A third reibeckite separate forms a plateau age of 1551 ± 7 Ma. The Valhalla $^{40}Ar/^{39}Ar$ ages of 1551 ± 7 Ma and 1533 ± 9 Ma are indistinguishable from the oldest $^{207}Pb/^{206}Pb$ ages of 1510 ± 15 Ma and 1543 ± 15 Ma from Valhalla and $^{40}Ar/^{39}Ar$ ages of 1554 ± 2 Ma, 1534 ± 4 Ma and 1524 ± 3 Ma from the nearby Anderson's Lode U deposit. These ages overlap with the timing of peak metamorphism in the Mt Isa area.

Mg-reibeckite has $\delta^{18}O$ values between 7.1 and 8.9 ‰. Calcite has $\delta^{18}O$ values between 10.6 and 12.8 ‰. Co-existing calcite and reibeckite have $\delta^{18}O$ values that indicate formation between 340 and 380°C, which matches temperatures calculated for peak metamorphism in this area. In addition, the reibeckite samples preserve δD values that range from -147 and -103 ‰. The calcite samples have $\delta^{13}C$ values between -2.8 and -0.7 ‰. These data indicate that the mineralising fluid may have involved a mixed metamorphic and magmatic source. The $\delta^{13}C$ values are close to marine values and similar to $\delta^{13}C$ values from carbonates throughout the Leichhardt River Fault Trough. The Mica Creek syn-orogenic pegmatites were emplaced into the Leichhardt River Fault Trough at 1532 ± 7 Ma and may be related to a larger, but unknown magmatic system that generated fluid and acted as a heat source. Alternatively, metamorphic fluids derived from clastic sediments in the Leichhardt River Fault Trough could have released fluids with low δD and $\delta^{18}O$ between 6 and 10 per mil. Two possible sources for metamorphic fluids include the Bottletree Formation and the lower Mt Guide Quartzite.

Prior to the Isan Orogeny, these packages contained large volumes of illite and chlorite that during the Isan Orogeny, would have released fluid as muscovite formed from illite and chlorite became more crystalline. Muscovite in the lower Mt Guide Quartzite has a δD value of -78 ± 12 ‰, and its formation from illite could have generated metamorphic fluids with this or a slightly lower isotopic value.

The results from this study strongly suggest that Valhalla is an albitite-hosted U deposit similar to those in the Ukraine, Brazil, Sweden and Guyana. This implies that Na metasomatised U deposits could be more widespread in Australia than previously documented. This style of deposit has a distinct alteration halo and geochemical signature that should help in the discovery of other similar deposits.

Acknowledgements: The author is indebted to Alan Eggers and Summit Resources who permitted collection of drill core from their core storage facility in Mt Isa and granted permission to present this data.

OTHER IMPORTANT DATES:

Tuesday 26th February: BEDG meeting

Topic: “SOM”-thing Different: Data Mining Geoscience Data

Speaker: Steve Fraser, CSIRO

Where: The Theodore Club, 333 Adelaide St, Brisbane

Time: 5:15 for 6:00pm

Data mining tool based on self organizing maps (SOM) for the integrated analysis of complex and disparate geoscience datasets.

Wednesday 16th April 2008: GSAQ Annual General Meeting and Seminar

Topic: Magnitude, timescales and causes of past global climate change – is the past the key to the future?

Speaker: Dr Cec Murray, Geological Survey of Queensland

Where: The Theodore Club, 333 Adelaide St, Brisbane

Time: 5:15 for 6pm; finger food and drinks

Cost: Free

8th – 10th October: Drilling for Geology 2008 Conference

Where: Royal on the Park, Brisbane Qld

Information from Mark Berry at mberry@ameconsultants.com.au

The Australian Institute of Geoscientists (AIG) is pleased to host a new technical conference focused solely on the collection and analysis of geological information from drilling. Be it grassroots exploration, mining operations or engineering projects, drilling is the prime method used for geological data collection and is often the biggest single cost centre for exploration and mine geology budgets.

ABSTRACTS are now invited and must address the main conference themes. DEADLINE – 29 FEBRUARY 2008. Drilling for Geology 2008 will also host a poster and trade exhibition in parallel with the conference as well as pre/post-conference workshops. AIG is seeking expressions of interest from companies wishing to run pre/post conference workshops and participate in the trade exhibition. There are also a wide range of SPONSORSHIP opportunities available.

Call for nominations: 2008 GSAQ Dorothy Hill and N.C. Stevens Medals

The GSA Qld division is currently seeking nominations for these medals.

The Dorothy Hill medal is awarded for contributions to the advance of geological knowledge in Queensland through publication of original research. The N.C. Stevens medal recognizes contributions to the geological community and/or promotion of public awareness of Earth Sciences in Queensland.

A written justification that will form the basis for a citation must accompany each nomination and should be forwarded to our secretary. Nominations for the Dorothy Hill Medal should preferably

include a comprehensive list of publications by the nominee. Nominations will remain current for a period of five years.

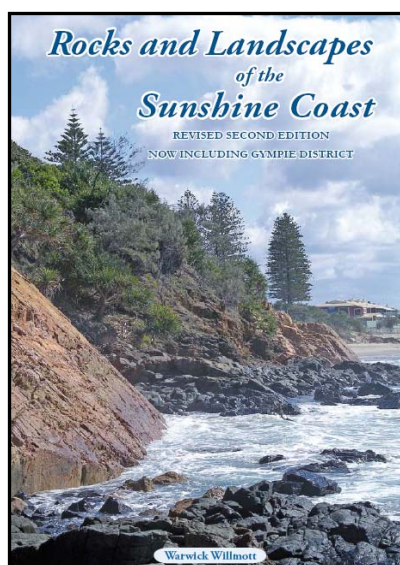
Details of the guidelines are available on the Queensland Division's website at (<http://www.qld.gsa.org.au/GSAQMedals>). Nominations will need to be received by the beginning of April for consideration at the April committee meeting.

Call for nominations for GSAQ Committee

Included with this newsletter, you should have received a nomination form for the GSAQ Committee. Alternatively obtain a copy from our website <http://qld.gsa.org.au>. **Election of a new committee for 2008/2009 will be held at the AGM at The Theodore Club on Wednesday 16th April.** Please nominate yourself or someone else for a position on the committee or pass it on to someone who you think might like to contribute to the Division. We would particularly welcome younger members and also members from industry.

New GSAQ publication

Rocks & Landscapes of the Sunshine Coast, Second Edition by Warwick Willmott



The popular GSAQ guidebook *Rocks & Landscapes of the Sunshine Coast* has been completely revised and expanded in colour to include the Gympie district. The book is available for purchase for only \$10.00 + \$3.00 post. For more information contact Warwick Willmott.

willmott@powerup.com.au

66 pages

Includes chapters on geological history, landscapes, coastal geology, landslide hazards, useful rocks and minerals, and where to see the rocks.

New Members

#101169	Richard ORLOWSKI	Ordinary Member
#101145	Dominic BROWN	Ordinary Member
#101038	Todd HARRINGTON	Ordinary Member
#101175	Alexander BEUTLER	Associate Member
#101176	Cristituto TOMARONG	Ordinary Member
#101177	Nicholas ANDERSON	Ordinary Member
#101170	Chris SMALLWOOD	Graduate Member



**THE INTERNATIONALLY RENOWNED
INFORMAL WEEKLY GET-TOGETHER FOR EXPLORERS AND MINERS
UNION JACK'S ALE HOUSE –**

English, Irish, Scottish & Welsh Pub - 127 Charlotte St, Brisbane CBD 5.30pm
on every Wednesday evening if your work/spouse/budget/health allows



Geological Society of Australia Inc, Queensland Division

**NOMINATION FORM
EXECUTIVE COMMITTEE AND REGIONAL REPRESENTATIVES**

Nominations for Executive Committee for 2008/2009 are now being accepted.

I,(full name)
agree to accept nomination for the position of (please circle one):

Executive Committee

- Chair
- Vice-Chair
- Honorary Secretary
- Honorary Treasurer
- Membership Secretary
- Newsletter Editor
- Committee Member (no limit to numbers)

Regional Representatives

- Central Queensland
- Northern Queensland
- Northwestern Queensland

Nominated by:

Seconded by:

Signed: Date:

Please **mail or fax** your nominations today.

**Stephanie Hamilton
Honorary Secretary
C/- Geological Survey of Queensland
Block A, 80 Meiers Rd
Indooroopilly QLD 4068
Ph. (07) 3362 9324
Fax (07) 3362 9343**

Further expressions of interest can be sent via e-mail to: stephanie.hamilton@dme.qld.gov.au

Queensland Committee 2007-2008

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Full page	17.2 x 24.1 cm	\$120	\$300
Half page	17.2 x 11.9 cm or 8.4 x 24.1 cm	\$75	\$375
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Pamphlets and Flyers (as inserts)		~ \$100	