

# MINERALS BRIEF

## Regolith Science in Mineral Exploration

June 2006 Edition No 10



### LEME begins new uranium exploration project with Mindax Ltd

LEME and the mineral exploration companies Mindax Ltd and Quasar Resources Ltd have embarked on a new uranium exploration project in the West Australian Wheatbelt. The unique partnership came about following LEME's unexpected discovery of anomalous levels of uranium, cobalt and other metals in the bores, lakes and drains of the Upper Avon River Catchment. The discovery was one of the outcomes from an acid drainage geochemical survey and risk assessment project with the Western Australian Departments of Environment and Agriculture.

In 2005, the project encountered uranium concentrations ten times above what mineral explorers call anomalous. This discovery has highlighted how groundwater geochemistry can be a useful tool for mineral explorers. In particular, how groundwater can provide an indication of regional geochemistry, as it incorporates geochemical information from a large area, reducing the amount of sampling required.

LEME Project Leader Grant Douglas said preliminary studies of the water samples have shown that uranium isotope ratios are close to equilibrium, which are similar to those found in waters originating from known economic uranium deposits.

"Mindax Ltd and Quasar Resources Ltd have entered into a two-year collaborative joint venture project known as 'Uranium Anomalies in Waters of the Western Australian Wheatbelt' with LEME to determine the origin of the uranium anomalies," Dr Douglas said.

Mindax Ltd Managing Director Greg Bromley said the company was interested by the results, particularly how some of the anomalous values were clustered together.

"We are now involved in a \$100,000 project with LEME to conduct a follow up study to find the source of the anomalous uranium levels which will hopefully lead us to a commercial deposit," Mr Bromley said.

The project's initial phase involves an infill sampling program over the area where anomalous uranium readings were encountered. Depending on the results of the sampling program, the project will be expanded to include regolith, geological and geophysical surveys.

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Geochemical sampling of salt lakes, drains and bores by LEME staff could locate new uranium deposits in the West Australian Wheatbelt.

### Report highlights new mineral field potential of South Western Australia

A report highlighting the potential for new mineral fields in the South West Yilgarn Craton of Western Australia has been recently released by the Centre.

The report entitled 'Laterite Geochemical Database for the Southwest Yilgarn Craton, Western Australia (Open File Report 201)', outlines regional laterite geochemical anomalies at a spacing close enough to recognise geochemical trends, major rock types and dispersion halos around significant mineralisation. Since its release, there has been a significant uptake of tenements in the South West Yilgarn Craton.

Headed up by geoscientists Matthias Cornelius (CSIRO) and Paul Morris from the Geological Survey of Western Australia (GSWA), the project was funded by the Minerals and Energy Research Institute of WA (MERIWA), CSIRO Exploration and Mining and LEME.

"Some of the results suggest there is potential for gold and base-metal mineralisation outside the known greenstone belt areas of the southwestern Yilgarn Craton," Dr Cornelius said.

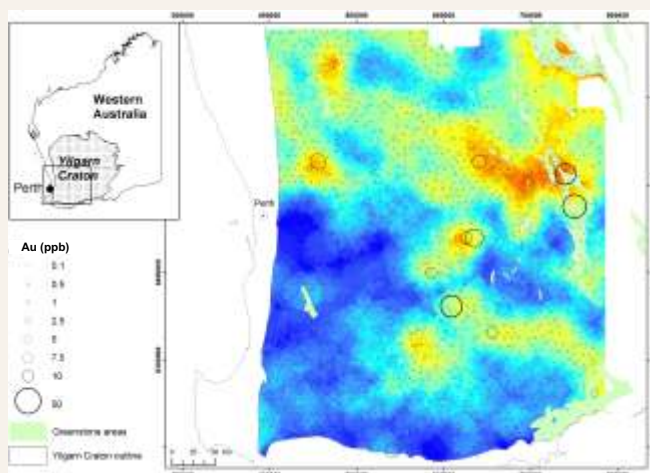
"In particular, the report's chalcophile element index shows there is potential for gold and base-metal mineralisation in the western most part of the Yilgarn Craton."

The chromium concentrations in granitic terrain also indicate there maybe mafic-ultramafic remnants outside the known greenstone belts."

The Atlas and associated database is the first release of a 53-element dataset generated from about 2,000 laterite samples taken in the South West Yilgarn Craton.

LEME plans to release a final report of the project, a Laterite Atlas of the Western Yilgarn, in 2007. The report will include a complete evaluation and interpretation of the data collected.

Open File Report 201, which includes a CD-ROM dataset, can be purchased for \$33.00 (incl GST) plus postage and handling. Copies can be obtained by going to <http://crclleme.org.au> and downloading a publications order form.



Plot of gold-in-laterite concentrations in South Western Australia (SW Yilgarn Craton).

### Northern Territory Regolith Map and Atlas officially launched

In March, LEME and the Northern Territory Geological Survey's (NTGS) hard work over the last three years has paid off with the launch of the NT Regolith Map and Atlas at the 2006 Annual Geoscience Exploration Seminar at Alice Springs.

The Atlas and associated map, which contains new regolith information, are the culmination of almost three years of collaborative work between LEME and the NTGS. During that time, LEME's Mike Craig (Geoscience Australia) and Ian Robertson (CSIRO) undertook extensive field and lab work to further define the Territory's regolith landforms.

"It's the first comprehensive dataset of spatially located regolith information for any Territory and State in Australia," Dr Craig said.

"The Atlas contains more than 600 colour photographs, as well as geochemical data tables and particle size distribution diagrams of the major regolith materials found in the NT."

Project expertise was provided by LEME partners Geoscience Australia and CSIRO, with NTGS participating in field work, data collection, as well as project and logistical support.



NTGS Director Richard Bresscianni (left) and LEME CEO Steve Rogers celebrate the launch of the NT Regolith Map and Atlas at 2006 AGES, Alice Springs.

The atlas and map are invaluable guides for mineral explorers considering the prospectivity of the largely under explored Northern Territory, much of which is covered by regolith.

Hard copies can be purchased from LEME for \$90 (incl GST). Order forms can be downloaded from the LEME website: <http://crclleme.org.au>. Free copies of the electronic atlas and map can be ordered from NTGS (email: [Geoscience.Info@nt.gov.au](mailto:Geoscience.Info@nt.gov.au)).

### LEME research showcased at Outcrop to Orebody Conference

In early May, more than 40 presentations including papers from LEME's Dr Ravi Anand (Program Two Leader) and Dr David Gray were delivered at the Outcrop to Orebody Conference in Kalgoorlie, Western Australia.

Celebrating the Silver Anniversary of the Australian Institute of Geoscientists (AIG) and the Association of Mining and Exploration Companies (AMEC), the conference provided insights into the kinds of contemporary geoscience employed by member companies and organisations to discover and develop new orebodies.

At the conference, Dr Anand delivered a keynote address entitled 'Advances in Regolith Research with Respect to Locating Mineralisation' that provided an overview to the wider geochemical and regolith science work done by LEME to investigate metal transportation mechanisms over areas of cover.

Dr Anand said there was a growing need in Australia to make surface geochemistry effective for exploration across complex depositional landscapes with shallow to deep cover.

"This has meant examining groundwater, gases, vegetation and bioturbation to see if and how they move metals through transported cover," Dr Anand said.

"My paper presented the findings from studies on vegetation that have shown geochemical anomalies over several buried gold and base metal deposits in the semi-arid and arid regions of Australia."

Dr Gray's presentation examined the hydrogeochemical expressions over the Baxter/Harmony Gold Deposit 90km north of Meekatharra, Western Australia, and the Harmony Nickel Deposit, 11km northeast of Leinster, Western Australia.

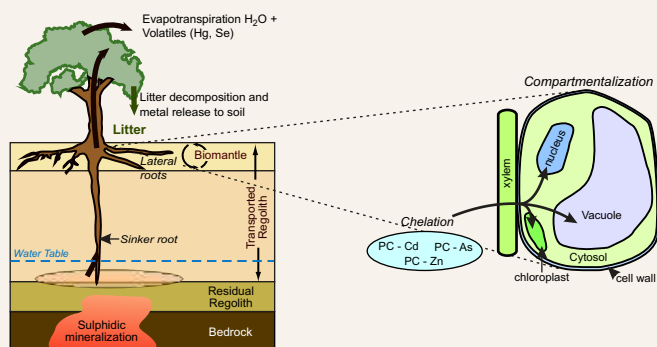
"Our studies have shown that many dissolved elements, including gold, can be used for exploration, while dissolved chromium, sometimes in naturally high concentrations, correlated closely with the presence of ultramafic rocks at the Baxter Gold Deposit," Dr Gray said.

"While at the Harmony Deposit, due to the low salinity and acidity, groundwater metal concentrations reflected the underlying lithology with nickel and chromium enriched groundwaters encountered near mineralised zones."

More than 200 people attended the conference with a lot of interest shown in LEME's research. However, further work is still required to develop non site specific biochemical and hydrogeochemical techniques that can be widely used by the mineral exploration industry.

Much of this research will be addressed as part of the AMIRA P778 Project 'Predictive Geochemistry in Areas of Transported Overburden.' This project will focus on identifying and testing the effectiveness of different mechanisms to transfer metals to the surface or near-surface in Australian regolith, and the efficacy of surface geochemical techniques in identifying anomalies through transported cover.

Abstracts of the papers presented can be downloaded from <http://crclme.org.au>



A diagram explains how plant biogeochemistry can express buried mineralisation.

## Research News

### Spectroscopic Regolith Logging

Further advances have been made in the development of unmixing algorithms for rapidly determining the relative abundance of regolith minerals in samples collected from chips, core or in the field. A critical part of this work has been the identification of procedures for effectively removing background noise from reflectance spectra. This approach will be tested while identifying kaolinite and mica abundances at the base of the regolith profiles, as it may assist vectoring.

Significant differences have been noted in the application of certain algorithms and spectral indices for regolith material discrimination when using chips versus pulps. For example, pulping results in an overestimate of halloysite versus kaolinite. This has had a significant bearing on the interpretation of transported/residual boundary and will influence recommendations on sampling/measurement strategies for the commercial application of Hylogging.

For further information about this research visit: [http://crclme.org.au/Research/p2projects/Objective\\_logging-0506.html](http://crclme.org.au/Research/p2projects/Objective_logging-0506.html)

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### 2006 LEME Minerals Exploration Seminar

The 2006 LEME Minerals Exploration Seminar is on at the Australian Resources Research Centre, 26 Dick Perry, Kensington, Western Australian on Friday, 11 August 2006.



Geochemical anomalies in spinifex, one of the topics at the LEME Minerals Exploration Seminar.

The seminar will feature technical presentations that summarise recently published LEME research, including PhD projects and industry-Centre collaborations that have had confidentiality lifted. All presentations are of direct relevance to mineral explorers.

For more information or to register, visit: <http://crclme.org.au>

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### LEME Technology Transfer

#### Upcoming presentations 2006:

- 23 June - Mineral Exploration Through Cover, Adelaide, SA
- 2 - 7 July - Australian Earth Sciences Convention, LEME session and field trips, Melbourne, Vic
- 11 August - LEME Minex Seminar, Perth, WA
- 27 August - 3 September - Goldschmidt Conference, Melbourne, Vic
- 26 - 28 September - Broken Hill Exploration Initiative Conference, Broken Hill, NSW

For the latest information on upcoming LEME presentations, go to:

<http://crclleme.org.au/NewsEvents/Events/newconf.html>

### LEME - MCA Regolith Geoscience Course Programme for 2006:

- 5-9 June - Advanced Remote Sensing (RSM) University of Adelaide, SA  
*Contact: Megan.Lewis@adelaide.edu.au*
- 19-23 June - Environmental Mineralogy, Australian National University, ACT  
*Contact: Email: lan.Roach@anu.edu.au*

### Recent Publications

(Available via our website <http://crclleme.org.au>)

- OFR 200 - Calcrete Geochemistry in the Cobar-Girilambone Region, New South Wales (Ken McQueen)
- OFR 201 - Laterite Geochemical Database for the Southwest Yilgarn Craton, Western Australia (M. Cornelius, P.A. Morris and A.J. Cornelius)

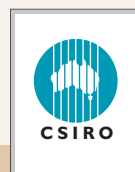
Past issues of the Mineral Brief can be downloaded from: <http://crclleme.org.au/Pubs/index.html>

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CRC LEME is the cooperative research centre for regolith geoscience with some 130 contributing researchers from eight Core Parties around Australia. We generate and apply regolith knowledge for mineral exploration and environmental management.



Your organisation can benefit from CRC LEME expertise.

<http://crclleme.org.au>