Three Ph.D. Studentships in
Geochemistry, Geochronology & Mineralogy for Research of Hot-Dry Rock Geothermal Systems in Queensland, Australia

The Australian continent is tectonically, relatively stable in comparison with many other continental settings; however, radiogenic heat production within the Australian continental crust is significantly high. This is attributed to an unusual enrichment in heat-producing elements in buried granitic rocks that occur mainly in South Australia and Queensland, and offer a high resource potential for geothermal energy development. Despite the well-known association between granites and high heat production, the spatial distribution of these magmatic rocks is poorly constrained, particularly in Queensland. In addition, some conspicuous heat anomalies are evident in central Queensland, but these do not seem to be associated with known distributions of granitic intrusions, and their origin remains unknown. The limited knowledge of the spatial extent and geochemical origin of the heat anomalies hinders our ability to successfully identify geothermal targets, make predictions of the system characteristics, and ultimately minimise risk in the crucial initial stage of resource estimation.

The Queensland Geothermal Energy Centre of Excellence in collaboration with the School of Earth Sciences and the Sustainable Minerals Institute at The University of Queensland, Australia, will coordinate a multidisciplinary geoscience research program to address the above outlined questions. Applications are invited for 3 PhD positions. The fully funded research will use recent advances in mineralogy, trace element/isotope geochemistry, and geochronology to develop innovative scientific methodologies for defining and locating high potential geothermal targets in Queensland.

Tasks:

1. One PhD project will apply new petrological, geochemical and geochronological concepts and techniques to characterise and distinguish the heat-producing granites in Queensland. This project will produce a comprehensive geochemical dataset (particularly trace elements and isotopes) for granites from areas of high geothermal potential. The proposed research will apply recent advances in igneous petrology and utilise laser ablation-inductively coupled plasma-mass spectrometry for zircon U-Pb geochronology and chemistry to acquire new knowledge in the igneous processes and conditions that may be responsible for generating the heat-producing capability of the granites. Detailed granite petrology will also be undertaken to understand in what mineral phases and in what concentrations, the heat producing elements are stored in, which can have important implications for reservoir quality and heat extraction.

2. A second PhD project will combine geochemistry (isotopes and trace elements) and geochronology (Rb-Sr and Ar-Ar) of hydrothermal alteration minerals from heat-producing granites and overlying sedimentary rocks as well as from other high geothermal potential areas of unknown origin. The scientific approach developed in this project will help to understand the timing and cause of heat production from the alteration of surrounding rocks and then to use this as a discrimination tool for identifying and evaluating the heat producing potential of targeted areas. This project will additionally provide new insights into geochemistry of fluid-rock interaction that will affect the reservoir properties and production behaviour during the geothermal operation.

3. The third PhD project will deal with heat flow measurements (in addition to the existing dataset) in new holes and detailed geochemical studies of water and gas samples of geothermal targets with high potential. Detailed isotopic (Sr, He, C, O, H) investigations of water and gas samples from selected field locations are required to identify high heat flow areas related possibly to young or recent magmatism, as well as any unknown heat-producing granite occurrences in Queensland.

The three projects will be based in the newly-established School of Earth Sciences at The University of Queensland, and will be jointly supervised by staff from the Queensland Geothermal Energy Centre of Excellence, the School of Earth Sciences, and the Sustainable Minerals Institute

We offer:

- Excellent research environment with advanced micro-analytical/geochemical facilities
- Expertise in isotope geology, geochronology, geochemistry, and petrology/mineralogy
- Cutting-edge research in geothermal energy exploration
- National/international contacts to leading research institutions all over the world
- A friendly and supportive multi-cultural environment

Requirements

To qualify for the Ph.D. positions the candidates must hold the equivalent of a BSc (Honours) or a MPhil. in geology, geochemistry, chemistry, or a related field.

Contact persons:

Send an application consisting of (1) letter of interest, (2) CV, and (3) names of two references to Mrs Glenda Heyde at g.heyde@eng.uq.edu.au or phone: + 61 7 3365 7955. Information on the scholarship conditions can be found on the Centre website: http://www.uq.edu.au/geothermal/prospective-students. For further information, please contact Dr. Tonguc Uysal at t.uysal@uq.edu.au.