PhD Studentship – Competition funded

Energy-critical metals: using global screening and plate reconstructions to model new exploration targets

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Scientific background

To fuel the world's appetite for electronics, batteries, solar panels and low-carbon technology the existing and often politically volatile sources of metals (including Li, Cu, Co, Ni) and rare earth elements need to be supplemented with new discoveries, perhaps equivalent in significance during the energy transition to the giant oil and gas fields that were being identified in the 1960s and 1970s. This project takes a global perspective and aims to understand the relationships between interconnected factors that control the formation and evolution of energy-critical resources – from formation to discovery. These factors include past and present plate velocities, tectonic/volcanic features, topography/paleotopography, climate/paleoclimate, crustal thicknesses, subducted slab parameters, mantle structure, seismicity, geology, geochemistry and many more. A 4-dimensional analysis of these variables will form the basis for a 'geological rule book' and ultimately a probabilistic model for resource development.

Methodology

In collaboration with Halliburton's energy-critical resource research team, this project builds on a global screening project (Wrobel-Daveau & Nicoll, 2022). It uses deep data mining and development of a global GIS database and applies statistical tests to understand inter-relationships between the geodynamic parameters at different plate margins. A model will be developed that predicts volcanic processes, chemistry and associated tectonics in deep time plate reconstructions. The model will be tested using known resource deposits and finally used to screen for and de-risk new exploration targets.

Training

The candidate will be trained in:

1) Data mining and management;
2) Advanced GIS analysis and associated statistical techniques;
3) The geologic, geodynamic and other processes that govern development of mineral resources;
4) Plate reconstruction methods, paleotopographic modelling and resource risking.

Person specification

We seek an enthusiastic individual who holds a degree in Earth Sciences, Geography, Geographic Information Systems (GIS) or related subjects. Experience in GIS is desirable.

This project has been shortlisted for funding by the ARIES NERC DTP and will start on 1st October 2023.

The **closing date** for applications is 23:59 on 11th January 2023.

Successful candidates who meet UKRI's eligibility criteria will be awarded a NERC studentship, which covers fees, stipend (£17,668 p.a. plus London Weighting at RHUL for 2023–23) and research funding.

International applicants (EU and non-EU) are eligible for fully-funded UKRI studentships.

Please note ARIES funding does not cover visa costs (including immigration health surcharge) or other additional costs associated with relocation to the UK. ARIES students benefit from bespoke graduate training. Excellent applicants from quantitative disciplines with limited experience in environmental sciences may be considered for an additional 3-month stipend to take advanced-level courses in the subject area.

ARIES is committed to equality, diversity, widening participation and inclusion in all areas of its operation. We encourage enquiries and applications from all sections of the community regardless of gender, ethnicity, disability, age, sexual orientation and transgender status. Academic qualifications are considered alongside non-academic experience, and our recruitment process considers potential with the same weighting as past experience.

Applications should be made via the Royal Holloway Direct website

For an informal discussion about the project please contact ian.watkinson@rhul.ac.uk