

## NERC-funded Research Experience Placement (REPs) Summer 2025

### *Project title*

Antarctic Black mudstone and the Toarcian Global Oceanic Anoxic Event

### *Lead supervisor*

Morag Hunter

### *Project description*

**Objective:** to investigate whether it is possible to identify the Toarcian Global Oceanic Anoxic Event in the Early to Middle Jurassic sediments of the Latady Formation.

**Fit to NERC Science remit:** The project falls within the science remit for NERC in several areas: specifically palaeoenvironments, sedimentary processes and ocean circulation (in the past).

Timescale: we wish to advertise the project for eight weeks, but a valuable contribution could be made over 6 weeks if the student has limited availability or needs to work remotely or part time. The longer timescale will give scope for extra analyses on the sediment samples, with time to process results.

### **Project outline:**

The first  $\delta^{13}\text{C}$  records of European black shales found a prominent negative carbon isotope excursion (CIE) in the organic carbon of the Toarcian, early Jurassic, linked to oceanic anoxia. There are still broadly two conflicting views to explain this phenomenon: 1) Early Jurassic extension created of a series of isolated basins. Deepening over time to below wave base, and a sediment supply restricted by natural barriers, led to reduced circulation and ultimately stratification and/or stagnation. 2) The black shales observed in basins of this age are the consequence of eustatic sea level changes and a global cause must be invoked to explain the anoxic event and the  $\delta^{13}\text{C}$  excursion. If the event really is global it should be observable in the Jurassic Basins of Antarctica too. The Latady Formation, Southern Palmer Land, Antarctica, consists of a series of shallow to deep marine sediments deposited from late early Jurassic through to the early Cretaceous. Very dark, iron rich, anoxic mudstones described from Hinde Nunataks are geographically close to Witte Nunataks which contain Middle Jurassic deposits. These sediments are lithologically very similar to Toarcian sections described from Europe. Samples from this unit and the underlying and overlying units are stored in the British Antarctic Survey rock store. After familiarising themselves with the literature, and potentially visiting known Toarcian localities in the UK, the student will select suitable samples for analysis of oxygen and carbon stable isotopes from various units throughout the formation to see if the same excursion in  $\delta^{13}\text{C}$  can be identified. No stable isotope work has ever been conducted on this section. There is already an extensive data set of geochemical analyses from the region and there may be the possibility to look at strontium and neodymium isotopic ratios of both sediment and carbonate remains to investigate the question of open or restricted ocean circulation patterns.

*Project restrictions*

None noted.

*Working arrangements*

Datasets already exist so remote working is feasible. There would be meetings twice weekly with the project supervisors, held via Teams if the student is remote.