



NERC Centre for Doctoral Training in Oil & Gas (2017 start)

Project Title: Microfossil records of basin evolution
Host institution: University of Birmingham
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Additional Supervisor (s): Dr Sev Kender (BGS)

Project description: The Early Jurassic of the UK is recognised as a significantly important interval of source-rock formation (e.g. Sinemurian Shales with Beef). Bottom water conditions change in response to basin evolution, (reflecting changes in depth and oxygenation) and in the most extreme cases, bottom water dysoxia can result in the deposition of organic rich sediments that may ultimately become hydrocarbon source rocks. Early Jurassic benthic microfossil assemblages (Foraminifera, Ostracoda) reflect environmental changes at and immediately below the sediment-water interface. These groups are known to be particularly susceptible to changes in bottom water oxygenation through changes of circulation/ventilation and/or surface productivity.

The study will focus on changing abundance, diversity as well as indicators such as morphogroup analysis to study the response of benthic ecosystems to changes in palaeo-depth, palaeo-oxygenation and palaeo-productivity through time. The project will evaluate changes in microfossil assemblages at a number of key localities (both onshore and offshore UK) to better understand the impact of palaeoceanographic and palaeoclimatic changes on bottom-water conditions.

Events such as the Toarcian Oceanic Anoxic Event are relatively well known and plans are advanced to re-core one of the key UK sections over this interval at Mochras, Wales (Hesselbo *et al.*, 2013 *Sci Drilling*.16, 81-91, ICDP and NERC supported). It is hoped that material from the new borehole will form part of this study alongside additional offshore records of the same age from the same region (e.g. 107/21-1 St Georges Channel). There are also a number of less well known/incipient OAEs recorded from areas such as Lincolnshire (Sinemurian, Riding *et al.*, 2013 *Palaeo*-3. 374, 16-27.), the Midlands and the Weald Basin which may also be incorporated into a wider, comparative study. Much of the material is already available through the BGS Core store, Keyworth.

CDT Research theme(s): Most particularly “Extending the life of mature basins” through a better understanding of temporal and spatial changes in depositional settings through time.

Research context: This project builds on existing research into Early Jurassic Micropalaeontology at Birmingham (PhD and MSc projects and the lead supervisor). The Micropalaeontology research centre at Birmingham currently has 5 staff members (specialising in foraminifera, calcareous nanofossils, ostracods, conodonts, and marine vertebrates), 6 PhD students and >18 MSc Micropalaeontology students. Analytical facilities include stable-isotope and trace-element analysis and a recent investment in new SEM suite.

Research costs: Dedicated Research Microscope with illumination £3,000, Consumables for processing and specimen cataloguing/storage £1500, SEM time 60 hrs over 4 years @ £40 per hour £2400.

Career routes: Biostratigrapher/Micropalaeontologist, Exploration Geologist.