Early Jurassic (Toarcian) palaeo-environmental change: New proxy data from the Mochras Borehole, Wales, UK

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The early Toarcian Oceanic Anoxic Event (T-OAE), one of the major carbon-cycle perturbations of the Phanerozoic, is hypothetically marked by elevated atmospheric pCO_2 leading to global greenhouse conditions, a likely accelerated hydrological cycle and increased delivery of river-borne nutrients to the ocean. Subsequent enhanced organic productivity and organic matter preservation in the oceans led to regional/global deposition of black shale.

The Mochras Borehole from western Wales, UK, is one of the most biostratigraphically complete and expanded marine successions known for the Early Jurassic (with a ~260 m thick Toarcian section). Core sedimentary description has been combined with Rock Eval, SEM, biomarker analysis and high-resolution $\delta^{13}C_{org}$ measurements, providing a new reference record for the Toarcian Stage.

The Toarcian in the Mochras core is generally characterised by alternations between limestone and mudstone. The hemi-pelagic Lower Toarcian lower *H. falciferum* zone (time equivalent with the T-OAE) in the Mochras core, in contrast to many European early Toarcian successions, lacks prominent black shale beds. We observe instead coarser grained, centimetre-thick silt to fine-sand mass-transport deposits and abundant supply of continental organic matter as well as detrital minerals derived from the nearby Welsh Massif, suggesting changes in the hydrological cycle. In addition, siderite nodule beds developed directly preceding and during the T-OAE interval in the Mochras core, suggesting changes in both the basin redox state and continental weathering intensity. We discuss new organic and inorganic geochemical data, combined with sedimentological observations in the context of global climate change and a possibly enhanced hydrological cycle during the T-OAE.