Paper Number: 3079

# Continuous high-resolution chemostratigraphic record of the Early Jurassic

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The Early Jurassic Period was a time of extreme global environmental change, characterized by a fluctuating greenhouse climate and short intervals of low-oxygen environments, enhanced marine organic-carbon burial and perturbations in faunal diversity [1-5]. The release and drawdown of carbon in the ocean-atmosphere system is one of the key factors affecting the Earth's climate and, subsequently, the environment. The carbon-isotope signature of the Toarcian Oceanic Anoxic Event (T-OAE), one of the main carbon-cycle perturbations in the Mesozoic, is well studied and interpreted to indicate the release and drawdown of carbon in the ocean-atmosphere system synchronously with super-greenhouse warming and enhanced organic-carbon burial [4,6]. Other carbon-isotope excursions, albeit of lesser magnitude, are known from the Early Jurassic in NW Europe, such as the negative excursion at the Pliensbachian – Toarcian boundary [7] and the positive shift in the Late Pliensbachian *margaritatus* Zone [4,8]. However, existing records of these events are scattered and discontinuous, and a comprehensive understanding of the genesis, timing, global extent, and environmental implications in comparison to the T-OAE is lacking.

A new organic carbon-isotope record from the stratigraphically expanded Llanbedr (Mochras Farm) drillcore (Cardigan Bay Basin, U.K., Wales) provides a chemostratigraphic reference curve for Early Jurassic sediments from an open-marine setting within the NW European realm. Isotope data has been generated from strata covering a 1040 m biostratigraphically complete Hettangian to Pliensbachian succession in a 30 to 100 cm resolution (1314 data points). The record gives new insights into the long- and short-term evolution of the global Early Jurassic carbon cycle and the magnitude and duration of carbon-cycle perturbations. The geochemical characterization of the isotope excursion intervals reveals local influences on the geochemical record, such as changes in carbonate mineralogy, or the source of

organic matter. Overall, the Mochras chemostratigraphic curve resembles the records documented in other European sedimentary basins, and has also revealed a new negative carbon-isotope excursion in the Upper Pliensbachian *margaritatus* and *spinatum* Zone. The multi-proxy analysis of this excursion interval and the correlation to a time-equivalent section from the Neuquén Basin, Argentina (verified by zircon U-Pb dating and ammonite biostratigraphy) gives insights about the spatial and temporal variation of carbon-cycle perturbations in a global context.

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