



Integrated stratigraphy and geochemistry of the Early Jurassic Posidonienschiefer from the Lower Saxony Basin, NW Germany

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The Posidonienschiefer (Early Jurassic, ~183 Ma) is the expression of the Toarcian Oceanic Anoxic Event (T-OAE) in Germany and Northern Switzerland and comparable to its correlative units in the UK (Jet Rock) and France (Schistes Carton) is composed of organic-rich, laminated clayey and calcareous mudstone. The carbon isotope record is marked by the occurrence of an up to ~7 ‰ negative excursion, both in bulk carbonate and organic carbon, thought to have been caused by a large release of methane (from gas hydrates, thermal metamorphic processes and/or volcanogenic sources). The sedimentology, biostratigraphy, organic geochemistry, astrochronology, and isotope chemostratigraphy of the Posidonienschiefer have been largely described in the literature, but most of the studies have focused on the regions of Southern Germany and Northern Switzerland with less information available from Northern Germany due to a lack of outcropping sections. Here we complement the existing datasets from NW Europe with an integrated study performed on cores from the Lower Saxony Basin, Northern Germany, an area that is still poorly correlated with the better known southern German localities. In particular, we present new results from high-resolution carbon-isotope stratigraphy, biostratigraphy and hand-held XRF analysis combined with quantitative mineralogy and organic geochemistry. Further advances in understanding are likely to come from taking a broader palaeogeographic overview of the development of the T-OAE through the whole of the Toarcian Stage, including consideration of sea-level and palaeoclimatic cycles that both pre-date and post-date the core negative carbon-isotope excursion. The new observations from Northern Germany indicate substantial differences in the expression of the T-OAE (duration of maximum organic carbon enrichment/development of hiatuses) compared to other locations from the Laurasian Seaway of NW Europe, contributing to a detailed understanding of the depositional environment during the T-OAE on a regional scale.