# Preliminary results of a pilot study on automated quantitative evaluation of minerals (QEM) in the Kimmeridge Clay Formation (Dorset, UK)

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Despite decades of research, the palaeoenvironmental and sedimentological controls leading to the unusual organic matter (OM) contents of the Kimmeridgian–Tithonian Kimmeridge Clay Formation (KCF) and contemporaneous successions around the Atlantic margins are still debated. Several studies conducted in the Dorset area, southern England, the type locality of the KCF, demonstrated the connection between OM content, depositional conditions, and astronomical parameters (eccentricity, obliquity, and precession).

The most recent cyclicity studies of the KCF conducted at Dorset use the datasets collected between 1996–2001 by the NERC-funded project *Rapid Global Geological Events* (RGGE). These datasets, coupled with GTS2004 ages are, until today, the basis to investigate astronomical dependent sedimentary cyclicity (including the organic-rich intervals) and to build astronomically based chronologies for the KCF and the Kimmeridgian-Tithonian time interval. New developments in analytical techniques and the recently updated numerical ages for the Kimmeridgian–Tithonian open the opportunity to, 20 years later, revisit the data collected by the RGGE project.

Our first step in this project was to perform a pilot study focusing on automated quantitative evaluation of minerals (QEM) in several mudstone, limestone, and dolostone lithofacies from the KCF outcrop at Kimmeridge Bay (Dorset, UK). QEM uses automated image analysis combining backscatter and energy-dispersive X-ray signals to identify minerals. This method generates a complete mineral identification of the studied sample and a detailed mineralogical dataset for the studied interval, potentially addressing issues such as sedimentary provenance (heavy minerals), diagenesis (chemical variation of mineral species), and climatic variation (clay mineral assemblages).

Our pilot study results in a concise sample-preparation and analysis protocol for the diverse suite of lithologies of the KCF. It also demonstrated the feasibility of using the QEMSCAN® for QEM of different KCF lithologies. Our goal is to generate new datasets to support a new sedimentological and astrochronology study of the KCF, aiming to improve our view of the paleoenvironmental controls that led to the deposition of this peculiar geological interval in the Atlantic margins.

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