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A 40 Ma-long record of paleoenvironmental conditions in the Central Atlantic Ocean during the Mid-Cretaceous: geochemical perspectives

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The redox sensitive element (RSE) concentrations of organic matter (OM)-rich sediments provide valuable information on paleoenvironmental parameters, including organic productivity, chemical evolution of the water mass, ocean residence times and sea-bottom redox conditions (e.g. [1]). Yet, their potential to understand global environmental changes is hindered by the scarcity of continuous geological records, often highly fragmented in space and time. In this contribution, we use a large dataset (494 samples) from five closely spaced sedimentary sections of exploration wells in the Central Atlantic to furnish a 40 Ma-long record of the palaeoceanographic conditions in a time spanning from the early Aptian to early Campanian. Studied intervals were originally located at different distance from continent, and intercept four oceanic anoxic events (OAE1c, OAE1d, OAE2 and OAE3).

Our complete geochemical characterization allows us to discuss the behavior in Mn, V, Ni, Cu, Zn, Mo, U and Se during the deposition of OM-rich sediments, as a function of their depositional environment through time. Global and regional perturbations of the marine circulation affect the supply of the aforementioned nutrient-related elements in the ocean water. The bio-essential role of several RSE elements promotes their enrichment at sediment-water interface during periods of high biological productivity and oxygen-depleted seafloor [2;3]. When depurated of the detrital input, our analyses show that RSEs are characteristically enriched with respect to global shale values [4]. Geochemical characteristics of the studied sequences suggest environment fluctuations from suboxic to sulfidic conditions for the entire interval.

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