



## **Palaeoenvironmental changes during the Toarcian Oceanic Anoxic Event: record from the Peniche section (Lusitanian Basin) and comparison with the Alpine Tethys and the Andean Basin**

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The Toarcian Oceanic Anoxic Event (T-OAE, Early Jurassic) was an episode of profound environmental change, which coincided with the onset of the Karoo-Ferrar large igneous province and was marked by a global carbon-cycle perturbation –evidenced by a negative carbon isotope excursion (CIE)–, a shift towards extreme greenhouse climate, oceanic anoxia, and the deposition of organic-rich sediments in widely distributed marine localities. Hitherto, most studies were conducted in restricted epicontinental basins of the NW European area, which limits our understanding of this global event. In particular, the diversity in T-OAE facies present in other basins, which is not always anoxic or enriched in organic matter, is often not sufficiently taken into account in existing models. In this study, we focused on the Pliensbachian–Toarcian reference section of Peniche (Portugal), which provides a continuous exposure of dominantly hemipelagic sediments. We generated a high-resolution dataset (whole-rock and clay mineralogy, grain size distribution, bulk-rock organic carbon isotopes, Rock-Eval pyrolysis, Hg content, total phosphorus content) to explore the palaeoenvironmental response to the T-OAE in the Lusitanian Basin. This record was compared to the dataset obtained from the Alpine Tethys and the Andean Basin to illustrate the contrasted expression of the T-OAE and the role of local conditions superimposed on the global environmental perturbation.

In addition, we tested the link between Karoo-Ferrar volcanic activity and the palaeoenvironmental changes recorded during the early Toarcian by using sedimentary mercury (Hg) concentrations. At Peniche, Hg content was measured in bulk sediment and wood fragments; this was done to complement previously published data and assess the potential role of terrestrial materials and their eventual reworking on Hg enrichments. Wood fragments have very high Hg values (up to 1000 ppb), higher than the bulk sediment, throughout the early Toarcian. The wood fragments record the well-known negative CIE excursion at the Pliensbachian–Toarcian boundary and during the T-OAE interval respectively, indicating that the Hg enrichments of the wood fragments compared to bulk sediments is most likely unrelated to the reworking of older sediments. The new data highlight that Hg enrichments may be related to other controlling mechanisms besides volcanism, and that they must be evaluated before interpreting Hg anomalies.