



## **Massive release of light carbon and rapid sea-level rise at the onset of the Early Toarcian Oceanic Anoxic Event (Jurassic)**

G. Suan (1), M. A. Rogov (2), F. Baudin (3), E. Mattioli (1), B. Pittet (1), S. Mailliot (1), F. Fourel (1) and C. Lécuyer (1, 4).

(1) UMR 5125 PaléoEnvironnements et PaléobioSphère, CNRS, France; Université Lyon 1, Campus de la DOUA, Bâtiment Géode, 69622 Villeurbanne Cedex, France.

(2) Geological Institute of RAS, 7 Pyzhevskii Lane, Moscow, 109017, Russia

(3) UMR 7072 Tectonique, Evolution et Modélisation des Bassins Sédimentaires CNRS, France; Université Pierre et Marie Curie-Paris6, 4 place Jussieu, 75252 Paris cedex 05, France.

(4) Also at Institut Universitaire de France, Paris, France.

The Early Toarcian (~183 millions years ago) records an episode of severe environmental changes that include the onset of an anoxic oceanic event (OAE), 7-10°C increase in seawater temperatures, calcification crises and severe biotic extinctions. Importantly, the OAE coincided with a 3-8 per mil negative carbon isotope excursion (CIE) in marine and terrestrial carbon, interpreted as the result of the massive injection of isotopically light carbon to the entire ocean-atmosphere reservoirs. Although some aspects of the event and of its consequences are well-documented in Northwest-European settings, very few data were available outside the western Tethyan Ocean, resulting in great uncertainties about the local or global nature of inferred environmental changes. Here we identify two abrupt shifts towards lighter C-isotope values in bulk organic carbon composed dominantly by terrestrial-derived material from an Early Toarcian shallow marine sedimentary sequence of the Arctic Taimyr region that confirm the global nature of the Early Toarcian carbon-cycle perturbation. Our data indicate that the injection of large quantities of isotopically light carbon into the atmosphere-ocean system coincided with a rapid sea-level rise, while anoxic condi-

tions developed in both the sediment and water column at the same time. This association between sea-level rise and decreased seafloor oxygenation is also evident at the beginning of the CIE in several sections from NW Europe, indicating that these environmental changes were not confined to the Arctic Ocean but likely reflect a global signal. We hypothesize that dramatic increase of atmospheric CO<sub>2</sub> concentrations related to the eruption of the Karoo-Ferrar large igneous province led to a glacio-eustatic rise in sea level, oceanic current re-organization and drastic changes of deep-water formation leading to a global decrease of bottom water ventilation. These conditions may have significantly enhanced carbon burial rates on a global scale, which in turn might have provided an efficient negative feedback to sequester exceptionally elevated atmospheric carbon concentrations.