Geophysical Research Abstracts
Vol. 21, EGU2019-7111, 2019
EGU General Assembly 2019

Onshore-offshore community change across the early Toarcian extinction event (Iberian Range, Spain): stratigraphic and environmental controls

Silvia Danise (1), Gregory Price (2), Marie-Emilie Clémence (2), Juan Gómez (3), Daniel Murphy (4), and Richard Twitchett (5)

(1) Dipartimento di Scienze della Terra, Università degli Studi di Firenze, Italy , (2) School of Geography, Earth and Environmental Sciences, University of Plymouth, United Kingdom, (3) Departamento de Geodinámica, Estratigrafía y Paleontología, Facultad de Cuancias Geológicas (UCM) and Instituto de Geociencias (CSIC-UCM), Spain, (4) Eastfield College, Dallas County Community College District, USA, (5) Department of Earth Sciences, Natural History Museum, United Kingdom

Causes of extinction during the early Toarcian (early Jurassic, ∼183 Ma ago) extinction event are debated. The onset of anoxic/dysoxic conditions has long been considered the main cause of faunal loss, until extinction was also observed in fully oxygenated sediments of the western Tethys. To investigate the possible causes of extinction in the absence of intense and prolonged anoxia, we integrated quantitative analyses of benthic macro-invertebrates, high-resolution geochemical analyses on the bulk sediment (TOC, δ13C, δ18O) and on brachiopod and belemnite calcite (δ13C, δ18O), and sequence stratigraphy, from two western Tethys sections (Iberian Range, Spain). We found that the dominant benthic groups, bivalves and brachiopods, show a different response to the extinction: brachiopods go through a complete species-level turnover, while many bivalve species range through the event. The two localities show different stratigraphic patterns of species loss. Last occurrences cluster at the transgressive surface in the deeper section, and are followed by a 2-metre interval barren of fossils before the appearance of new species or the re-appearance of range-through species. Last-occurrences cluster instead at the maximum flooding surface in the shallower section, and there is no barren interval here. In the shallower section, changes in richness and evenness correlate with TOC change, suggesting that variations in nutrient input from runoff, and the possible local onset of low-redox conditions (TOC > 4 wt%), controlled faunal diversity. In the deeper section, in contrast, community change correlates with changes in δ18O, indicating that temperature and salinity variations might have influenced faunal change. The observed differences between the two localities highlight the important role of local sedimentary and stratigraphic processes in controlling the shape of the geochemical and fossil record, and the need to study multiple sections along onshore-offshore gradients before extrapolating local results to regional or global scales.