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New multiproxy record of the Jenkyns Event (a.k.a. Toarcian Oceanic Anoxic Event) from the Mecsek Mountains (Hungary)

Müller, T.[1,2], Price, G.D.[3] , Bajnai, D.[4], Nyerges, A.[5], Kesjár, D.[6], Raucsik, B.[7],. Varga, A.[7], Judik, K.[6], Fekete, J.[6], May, Z.[8], and Pálfy, J.[1,5]

[1]Dept. of Physical and Applied Geology, Eötvös Loránd University, Budapest, H-1117 Hungary; beregond02@gmail.com; palfy@elte.hu
[2]Earth Science Institute, Slovak Academy of Sciences, Bratislava, 840 05 Slovakia
[3]School of Geography, Earth & Environmental Sciences, Plymouth University, PL4 8AA, United Kingdom
[4]Institut für Geowissenschaften, J. W. Goethe-Universität, Frankfurt, D-60438 Germany
[5]MTA-MTM-ELTE Research Group for Paleontology, Budapest, H-1431 Hungary
[6]Institute for Geological and Geochemical Research, RCAES, Hungarian Academy of Sciences, Budapest, H-1112 Hungary
[7]Dept. of Mineralogy, Geochemistry and Petrology, University of Szeged, Szeged, H-6722 Hungary
[8]Institute of Materials and Environmental Chemistry, Hungarian Academy of Sciences, Budapest, Hungary

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The oceanic anoxic event in the Early Toarcian, commonly referred to as T-OAE, led to widespread deposition of organic-rich black shales and geochemical anomalies in elemental distribution and multiple isotope systems in the Early Jurassic ocean. Best characterized by its hallmark carbon isotope anomaly, the event is widely regarded as a prime example of rapid greenhouse warming-related changes in the Mesozoic Earth system. However, despite numerous studies, details of its forcing mechanisms, exact duration, and role of regional effects remain debated. Here we present new data (high resolution organic carbon isotope, calcareous nannofossil and elemental geochemical analyses) from the black shale-bearing Lower Toarcian section in the Réka Valley, Hungary, with the aim of assessing any regional differences in the sedimentary and geochemical record, and their bearing on the underlying oceanographic and climatic processes. Following relatively positive values our carbon isotope data show a negative trend with a steep, stepwise drop in the values, in two negative shifts, reaching their minimum before a positive trend with oscillations characterizing the top part of the section examined. The shape of the curve and nannoplankton biostratigraphy (recognition of zones NJ5b, NJ6 and NJ7) allow reliable correlation of our data with the global carbon isotope perturbation recorded elsewhere in the Early Toarcian. We propose that it would be fitting to rename the T-OAE as Jenkyns event, to honour seminal contributions of Hugh Jenkyns. Our cyclostratigraphic analysis suggests that the duration for the negative isotope shift at Réka Valley, based on the 35 kyr long obliquity, is 192–262 kyr. This falls within the range of previous estimates but support the shorter durations among them. Spectroscopic analyses suggest that the source of the organic matter, marine algae according to previous studies, did not change considerably during the main negative carbon isotope excursion. The variability observed in major element concentration and enrichments relative to the average shale in the Réka Valley black shales can be regarded as mixtures of terrigenous aluminosilicates and calcium carbonate as two endmembers. Consequently, the terrigenous compositional endmember of the studied black shales consists of a mixture of an illitic/smectitic and a kaolinitic clay and hence support previous suggestions of increased weathering under humid monsoon-like climate in the hinterland during the Jenkyns event.