Geophysical Research Abstracts
Vol. 18, EGU2016-8087, 2016
EGU General Assembly 2016

Geochemical analysis of Lower Toarcian black shale from Mecsek Mountain, Hungary

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The Early Toarcian (Early Jurassic; 183 Ma BP) is in focus of ongoing research, as this period has been associated with profound environmental changes, comprising global warming, sea level rise, diversity loss in marine ecosystems as well as with a major carbon cycle perturbation, expressed by a negative carbon isotope excursion (CIE). Moreover, this period is highlighted by the widespread accumulation of organic-rich sediments that can be linked to oxygen depletion in shelf settings and has been therefore associated with the Early Toarcian Oceanic Anoxic Event (T-OAE). Several studies investigated organic-rich sediments from NW Europe, where deposition occurred in the epicontinental basin of the Western Tethyan shelf, reflecting a strongly restricted hydrodynamic regime with prolonged water column stratification [1]. On the contrary, only a few studies investigate sediment section from Eastern Europe, a less-restricted paleogeographic setting in proximity to the open Tethyan Ocean.
Here we present the first bulk geochemical and biomarker study of organic-rich sediments from southern Hungary. In the Réka Valley the Early Toarcian is represented by the Rékavölgy Siltstone Formation (RSF) that is exposed in Eastern Mecsek Mountains. Sediments are composed of laminated and thin-bedded clay- and silt-stones, with intercalations of mixed carbonate and siliciclastic turbidites, deposited in a low-energy distal fan environment. A detailed correlation of this section with records from the epicontinental basins of the Western Tethyan shelf is complicated by the absence of index fossils. However, a negative shift evident in the carbon isotope record, established for the Réka Valley section, suggest that the sediment interval investigated correspond to the T-OAE and the related carbon cycle perturbation.
Sediments are rich in organic matter, with a high but variable total organic carbon (TOC) content that range from 1 to 14 wt.% and show an increasing trend throughout the section investigated. Variable, but mainly high HI values (100–700 mgHC/gTOC) allow attributing the OM to a type II kerogen. Results are in agreement with previous studies showing that the OM is mainly composed of liptinites, which point to algal and land plant-derived OM [2]. Moreover, variable contributions from marine and terrigenous sources are also attested by the ratio of isoprenoids (pristane and phytane) and the corresponding n-alkanes.
Accumulation of OM occurred under mildly reducing, most likely anoxic, conditions as indicated by Pr/Phy ratios of about 1.5 and mainly low HHI values <0.1 [3]. It can be thus anticipated that OM preservation was favoured by low oxygen levels in bottom waters and high sediment accumulation rates, resulting in an efficient OM burial. Therefore, OM accumulation at the western margin of the Tethyan Ocean was controlled by processes differing from those in the epicontinental basin of the Western Tetyhan shelf. A high surface productivity at the slope of the shelf might have been stimulated by the upwelling of nutrient-rich bottom waters and might further promoted the formation of an expanded oxygen minimum zone.

[1] McArthur, J. M., Algeo, T.J., van de Schootbrugge, B., Li, Q., Howarth, R.J., 2008. Basinal restriction, black shales, Re-Os dating, and the Early Toarcian (Jurassic) oceanic anoxic event. Paleoceanography 23, PA4217, doi: 10.1029/2008PA001607.
[2] Varga, A., Raucsik, B., Hámorné Vidó, M., Rostási, Á., 2007. Isotope geochemistry and characterization of hydrocarbon potential of black shale from Óbánya Siltstone Formation. Földtani Közlöny 137, 449-472.
[3] Peters, K.E., Walters, C.C., Moldowan, J.M., 2005. The Biomarker Guide: Volume 2, Biomarkers and Isotopes in Petroleum Systems and Earth History. Cambridge University Press, 1132 pp.