Geophysical Research Abstracts
Vol. 19, EGU2017-7807-1, 2017
EGU General Assembly 2017

Clumped isotope analyses suggest constant seawater temperatures at the Middle–Late Jurassic transition in the Subboreal realm

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Clumped isotope analyses were performed on a set of 18 well-preserved belemnite rostra and 4 ammonite shells derived from uppermost Middle–Upper Jurassic strata of the Russian Platform. The aim of the study is to reconstruct palaeoclimatic variations and paleoceanographic changes during and after the Middle–Late Jurassic transition in the Subboreal realm.

Previous studies, based on the δ^{18}O values and elemental ratios of belemnite rostra, suggest the presence of a prolonged Late Callovian–Middle Oxfordian cool period with bottom waters at ~5 °C, followed by a pronounced Late Oxfordian–Late Kimmeridgian warming (by 6.5–9.5 °C) in the epicontinental Middle Russian Sea. The occurrence of cold bottom waters is interpreted as a result of the formation of wide marine connections with the Arctic Sea during a sea-level highstand. As an independent proxy for palaeotemperatures, clumped isotopes could estimate the extent to which the δ^{18}O record is influenced by local salinity variations.

Clumped isotope analyses suggest constant bottom water temperatures (~15 °C) of the Middle Russian Sea during the latest Callovian–earliest Late Kimmeridgian. This questions the previous interpretation of the δ^{18}O record. The Upper Oxfordian–Lower Kimmeridgian decrease in δ^{18}O values, which was previously explained by warming, probably results instead from a decrease in salinity. A decrease in sea level after the Middle–Late Jurassic boundary transgression could have contributed to the enhanced freshwater runoff. Consequently, the limited water exchange in the restricted basin of the Middle Russian Sea probably led to the significant decrease in salinity and water δ^{18}O values.