

Stratigraphic implications of trace element and strontium-isotope analyses of Kimmeridgian shell calcite from the Lower Saxony Basin, Germany

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Stratigraphic uncertainties due to the lack of open marine marker fossils (e.g. ammonites) hamper the precise age assignment and stratigraphic correlation of Kimmeridgian strata found in the Lower Saxony Basin of Northern Germany. Correlation of these deposits with the Jurassic standard ammonite zonation is still difficult, since the existing ostracod biostratigraphy is facies-controlled and of only limited stratigraphic precision. In this study, a chemostratigraphic approach has been chosen and biogenic shell material produced by brachiopods, oysters and lithotids is evaluated for its reliability to act as proxy of the original Jurassic seawater strontium isotope composition. Low-Mg calcite shells have been collected from three stratigraphic sections accessible in open-cast quarries located in the Lower Saxony Basin of Northern Germany. In order to identify diagenetically altered shell calcite, trace element and stable isotope analysis of 227 calcite samples (oysters=101; brachiopods=60; *Trichites*=52) has been carried out. The geochemical results reveal that (1) concentration of different trace elements varies between the different groups of shell-forming organisms, which may be related to vital effects and (2) high strontium contents, low Mn and Fe contents and the lack of correlation between these elements indicate near-pristine calcite shells, and therefore shells are supposed to record the ambient sea water composition during the Late Jurassic. Strontium-isotope ($^{87}\text{Sr}/^{86}\text{Sr}$) analysis of diagenetically screened samples indicates an Early Kimmeridgian age of the studied deposits, which is in accordance with ostracod biostratigraphic data. An increasing trend in $^{87}\text{Sr}/^{86}\text{Sr}$ with stratigraphic height fits well with the global strontium-isotope curve. Besides, similar $^{87}\text{Sr}/^{86}\text{Sr}$ ratios derived from different organisms from a single stratigraphic level highlight the suitability of the shells for strontium-isotope stratigraphy. Despite the shallow-marine character of the studied deposits, no evidence for significant riverine influence on the strontium-isotope signature is observed. The new chemostratigraphic data will provide a more precise age assignment for Kimmeridgian strata in the Lower Saxony Basin and thus enable the establishment of a solid integrated stratigraphic scheme that can be used for correlation on both regional and global scale.