

## Corrosion of coccoliths as a proxy for pH in sediments

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Cyclical variations in the degree of coccolith corrosion were recorded from the Middle Miocene of the central Paratethys epicontinental sea. The application of multiproxy palaeontological and geochemical data enabled a complex interpretation of the palaeoenvironment. Anti-estuarine circulation has been suggested for this period, with the surface waters having a Mediterranean affinity and the bottom-waters being Paratethyan. The cyclical oscillations of quantitative palaeontological parameters were probably triggered by obliquity cycles. Eutrophic to mesotrophic conditions were based on primary intrabasinal production. Although the biostratigraphically-determined age agrees with the Mi-3b pronounced global cooling, a significant influence of local mesoclimate was deduced from the persistence of a warm subtropical climate that influenced both the continental and marine biotopes. Palaeodepth – a factor important for the dissolution of coccoliths – could not be precisely interpreted for the epicontinental sea. Using several proxies (ostracoda, foraminifera, difference in Mg/Ca palaeothermometry between the surface and bottom waters, and otoliths), a palaeodepth of about 200–500 m was predicted.

pH and  $\text{CO}_3^{2-}$  oscillations in the sediment were estimated using two independent proxies. For the first proxy, the Mg/Ca offset between infaunal and epifaunal foraminifera was based on differences in the incorporation of Mg and Ca into the foraminiferal shells during calcification, which was influenced by gradients in pH and  $\text{CO}_3^{2-}$  concentrations in the sediment. For the second proxy, the foraminiferal  $\delta^{13}\text{C}$  was based on benthic species with different palaeoecological requirements. A comparison of the  $\delta^{13}\text{C}$  values points to the life strategy of a particular species within the sediment. Possible pH and  $\text{CO}_3^{2-}$  oscillations were reflected in the foraminiferal  $\delta^{13}\text{C}$  data, as opposed to the species that have comparable habitat preferences.

The ratio of corroded coccoliths, as well as the intensity of the corrosion, agrees with the interval with decreased pH, as interpreted from the above-mentioned proxies.