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Rapid climatic fluctuations and seasonality during the Upper Jurassic (Oxfordian-Lower Kimmeridgian) inferred from oyster shell δ^{18}O.

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Recent paleontological and oxygen isotope data inferred mainly from fish teeth (Lécuyer *et al.*, 2003), brachiopods (Carpentier *et al.*, 2006), and belemnites (Riboulleau *et al.*, 1998) reveal a cold episode around the Callovian-Oxfordian boundary, followed by a global warming trend from the earliest Oxfordian to the Kimmeridgian. We present here new oxygen isotope data from well biostratigraphically constrained oyster shells from the Upper Jurassic of the eastern Paris Basin, that allow improving the thermal evolution of western Tethyan upper ocean waters within the Oxfordian-Lower Kimmeridgian interval. Fifty-four oyster shells were carefully screened for potential diagenetic alteration using cathodoluminescence and included non luminescent parts large enough to carry out 200 analyses. This gives an average of 4 analyses per shell. Intra-shell variability was calculated from 36 oyster shells that have more than 2 isotopic data. More specifically, this intra-shell variability was explored within 2 transects drilled perpendicularly to the growth lines of two large oysters. The roughly sinusoidal distribution of the δ^{18}O values along the two transects and the dependence of its amplitude with bathymetry suggests that the intra-shell variability reflects seasonal variations of temperatures and/or salinity. An amplitude of about 6˚C in shallow oolitic environment and of about 2˚C in deeper offshore environment are calculated using the modern seasonal variation of salinity in tropical surface waters.

The global evolution of the δ^{18}O values of the oyster shells reveals that the warming trend of the Oxfordian-Kimmeridgian interval is punctuated by a cooler episode

during the earliest Upper Oxfordian. Assuming a $\delta^{18}O_{seawater}$ of -1 per mil for a continental ice-free earth, and adding a correction for the evolution of the estimated bathymetry, a warming of about 3˚C of the upper ocean waters during the Lower Oxfordian-Middle Oxfordian transition is calculated, with maximum temperatures reaching 20.1˚C in average in Late Middle Oxfordian. In the Upper Oxfordian, a cooling of about 5˚C is identified from the oyster shells $\delta^{18}O$ data. During the Lower Kimmeridgian, the temperature increases again by about 8˚C to reach 23˚C in average during the upper part of the Lower Kimmeridgian. If a d18Oseawater of 0 per mil is used, to account for a dominance of evaporation over precipitation in the subtropical zone, the calculated temperatures are about 4˚C higher.

The origin of these climatic fluctuations remains to be clarified.

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