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U–Pb dating of fossil oyster calcite : new insights for shallow marine environments.

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Many sedimentary basins lack volcanic ash layers or age-indicative fossils. To better understand deposition in these basins, new geochronological approaches are essential.

Recent advances in U–Pb dating of carbonates have opened up new perspectives for dating sedimentary records. Applying this method to oyster fossils enables radio-isotopic dating of shallow marine deposits, allowing to obtain age constraints for sections previously difficult to date.

Our study focuses on dating the infill of the Digne-Valensole foreland basin (SE France), a marginal part of the Mediterranean domain during the Miocene. By integrating U–Pb dating of oyster fossils with magnetostratigraphy, we aim to locate the stratigraphic position of the middle Miocene Climate Transition (mMCT) as a first step towards determining what its impact was in the region.

We here present new U–Pb ages for Miocene oyster calcites of the Digne-Valensole basin obtained using LA-ICP-MS at the ISTerre Micro-Analytical Platform (IMAP, Grenoble, France).

The quality of the obtained ages and the uncertainty therein are variable, and we currently aim to better understand sedimentary, diagenetic and biotic factors that influence the reliability of the obtained ages. Nevertheless, three Langhian-Serravallian strata provided U–Pb results that allow to calculate high-quality regression lines with very low analytical uncertainties of 1-3% (2σ) and not a trace of disturbance. To test the accuracy of the obtained ages, we will sample and analyse oysters with a well-known age from Cretaceous and Miocene strata in Morocco. These come from a variety of depositional and diagenetic settings in order to increase our understanding in the importance of these factors. Additionally, we are investigating a remarkable, well-dated oyster shell from the Austrian foreland basin which exhibits outstanding signals both in U and Pb isotopes. If it can be calibrated with ages from Morocco, it may become the very first biogenic calcite standard for LA-ICP-MS analysis. These calibration efforts represent a crucial step in improving the reliability of U–Pb dating for oyster shells.

Based on our preliminary results, we think that U–Pb dating of oyster shells is a promising tool for refining the temporal framework of shallow marine records and overcome limitations faced by other methods.