Factors influencing early and late diagenesis in cenozoic marine, palustrine, and lacustrine carbonates of the Paris Basin (France): Insights from calcite U–Pb geochronology"

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Résumé

Determining the age and spatial distribution of diagenetic modifications in carbonates, especially in non-marine carbonates, is often challenging due to limited understanding of how tectonic and climatic factors influence diagenetic fluid circulation. This study combines petrographic observations, carbon and oxygen isotope analysis, and in-situ calcite U–Pb geochronology to determine the main factors that govern the diagenetic processes affecting Cenozoic non-marine and marine carbonates of the intracratonic Paris Basin. Twenty-one diagenetic processes were identified, including calcite cementation and mineralogical replacement by dolomite, calcite, and silica. Eleven calcite cementation events and shell neomorphism were dated by in-situ U–Pb dating. The absolute and relative dating show that most diagenetic processes occurred early in near-surface settings, and were largely controlled by depositional environments and facies. Notably, alternating dry and wet periods favored early silicification especially in palustrine carbonates, suggesting a significant role of biological and pedogenic processes in silica precipitation. Post-Eocene geodynamic evolution significantly influenced late diagenesis across all carbonate environments. U–Pb dating indicates that slight basin-wide deformation during (1) the Late Rupelian–Chattian, (2) the Burdigalian, (3) the Langhian, and (4) the Tortonian–Messinian, which are associated with Pyrenean and Alpine orogenies, imply erosion and late pore-filling cementation in the uplifted northern part of the Paris Basin, while subsidence in the South facilitated lacustrine-palustrine and

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fluvial sedimentation and early karstification. This means that despite being over 500 km from the orogenic fronts, the Pyrenean and Alpine orogenies exert a considerable influence on the diagenesis of intraplate basins.

Mots-Clés: Carbonates, diagenesis, U–Pb dating, lacustrine carbonates, palustrine carbonates