

Origin of low permeability and porosity in Middle Jurassic carbonate formations in the eastern part of the Paris Basin

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Middle Jurassic carbonates underlying Callovian-Oxfordian clayey formations which have been chosen by the French government to settle a laboratory for nuclear waste disposal display low values of porosity and permeability ($\phi < 10\%$ and $K < 0.05$ mD). The main objective of this study is to establish a chronology of diagenetic events which are responsible for low porosity and permeability. Petrographic observations including conventional and cathodoluminescence microscopy were performed on about 200 carbonate thin sections. Six calcitic spar zones, two dolomitic zones and several phases of fractures and styloliths are recognized and their chronology is established.

Cement quantification displays the predominance of two calcitic spar zones (75% of total cementation). O, C isotopes and fluid inclusions of these two calcitic phases suggest marine parent fluids with a subordinate component of meteoric water. In the geological history of the Paris Basin, meteoric inputs in the marine parent fluid might have been triggered by two Cretaceous uplift phases thus indicating that most of cementation processes have occurred during burial diagenesis. A latter blocky spar zone which represents less than 5% of the total cementation may have precipitated in meteoric waters during the last Oligocene extension phase.