Deformation bands and stylolites controlling bedding-parallel flow in the Dogger Formation (Sommerécourt quarry, eastern Paris Basin)

Ysabel Henriot*†[1], Efstratios Delogkos‡[2], Cédric Bailly[1], Jean-Valery Donge[1], Benjamin Brigaud[1], and Antonio Benedicto§[1]

[1]Géosciences Paris Saclay – Institut National des Sciences de l'Univers, Université Paris-Saclay, Centre National de la Recherche Scientifique, Centre National de la Recherche Scientifique : UMR8148, Université Paris-Saclay : UMR8148, Institut National des Sciences de l'Univers : UMR8148 – France
[2]Beicip Franlab – Beicip Franlab – France

Résumé

The Dogger Formation (Middle Jurassic) is a carbonate aquifer studied within the framework of the PEPR Sous-sol bien commun project in the Rhine Graben for its reservoir properties at intermediate depths (between 200 m and 2000 m). A recent study, based on outcrops of its eastern continuation in the Paris Basin at the Sommerécourt quarry, has shown that, in addition to faults affecting these limestones, bedding planes play a critical role as conduits for the horizontal flow of fluids (Delogkos et al., 2025 – JGS). These observations highlight the importance of integrating both faults and bedding planes to properly assess connectivity and improve fluid-flow models in carbonate reservoirs.
This study focuses on understanding the nature and origin of these bedding-parallel flow paths through a structural and petrophysical analysis combining facies description, deformation-structure analysis, petrographic study of thin sections (optical microscopy and cathodoluminescence), and permeability measurements (using TinyPerm). Field observations show that the occurrence of deformation structures is strongly controlled by lithology and sedimentary facies. In the upper part of the carbonate sequence, deformation bands develop parallel to bedding within micritic and clay-rich horizons. In the lower part, more consolidated facies host planar stylolites, either parallel, vertical, or oblique, ranging from a few centimeters to several decimeters.

Permeability measurements indicate that these structures - deformation bands and planar stylolites - systematically increase the permeability of the rock. These results demonstrate the significant role of such structures in enhancing reservoir properties, even in a low-deformation context. This study improves the characterization of the reservoir and underscores the need for multidisciplinary approaches to accurately model fluid flow in carbonate aquifers.

*Intervenant
†Auteur correspondant: ysa.henriot@gmail.com
‡Auteur correspondant: delstratos@hotmail.com
§Auteur correspondant: antonio.benedicto@universite-paris-saclay.fr

Mots-Clés: diagenesis, stylolites, deformation bands, permeability, limestones