de l'agencement des grains dans la connectivité du réseau poreux. Enfin, cette étude apporte une meilleure compréhension des hétérogénéités de perméabilité observées au sein de roches réservoirs microporeuses.

6.5.4 (o) Characterization and origin of permeability-porosity heterogeneity in shallow-marine carbonates : from core scale to 3D reservoir dimension (Middle Jurassic, Paris Basin, France)

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Nuclear magnetic resonance (NMR), stable isotope geochemistry on micro-drilled core samples, NMR well-logs and 3D modeling are used to investigate the carbonate permeability-porosity heterogeneity along 230 m-thick limestones of the Paris Basin. Despite the global low porosity and permeability of the limestones, two aquifers units with porosity greater than 15% were identified. These two aquifers are very different in terms of pore through radii and NMR signal. The first one (A1 : Aquifer 1) is a 7 m-thick mudstone unit, dominated by extended microporosity with pore throat radii of 0,25 μm to 0,3 μm. The second one (A2 : Aquifer 2) is a 15 m-thick oolitic grainstone units showing macropores reaching 100 μm and pore throat radii of 32 μm. From core descriptions and wireline logs on 26 wells, a 3D static geological model is build. The fine tuning of permeability calculations from NMR logs realized along 12 of the wells, allows porosity and permeability heterogeneity to be distributed within a 3D model at the reservoir scale (area of about 2000 km2) which match the flow behavior illustrated by well tests.
Associated with early meteoric calcite cements and poorly developed burial blocky calcite cements, the porous and permeable intervals may be predicted in two stratigraphic and diagenetic considerations. Firstly, the syn-sedimentary meteoric dissolution or neomorphism of the initial high magnesium calcite and aragonite particles or clasts into low magnesium calcite particles or cements prevented most mechanical and chemical compaction during the first steps of burial. Secondly, the regional stratigraphic architecture reveals the presence of local permeability barriers, which prevented Early Cretaceous lateral meteoric water circulation and the associated burial calcite cementation.

6.5.5 (o) Paleostress patterns associated to a sand injection system : microstructural and AMS evidences of stress rotations during sand injection processes ? (SE Basin, SE France)

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Understanding the way low-permeability rocks fracture within space and time is a challenging aim in several applied problems, such as industrial hydraulic fracturing processes. The turbiditic system of the Vocontian Basin offers a unique opportunity to follow the way the apto-albian Blue Marls formation deforms : the early fracture network is indeed filled with sandy injections that constitute markers of early deformation in the host rock.
We performed complementary studies to reconstruct the fracturing history of this marly host rock. This first studies were focused on the Bevons Hill (SE Basin, France). The macroscopic organization of the structures was deduced from mapping thanks to differential GPS. Map was completed by the analysis of paleostress in marls by both a classical microstructural studies on joints, veins and faults kinematics and by AMS analyses. An attempt to access the magnetic fabric into sand injections was equally done. Particular attention was paid on relationships between injections and faults, and especially timing between the fracturing and injection processes.
AMS data, together with kinematic analysis of fault sets, put forward a clockwise rotation of the compression axes from N340 to N060 in the Blue Marls formation. The first increments of deformation are deduced from AMS data in the limy beds of the hostrock, but are not recorded at macroscopic scale. N/S to N060 successive compressions induce incremental fracturing of the hostrock, characterized by successive conjugate superimposed strike slip fault patterns. Field evidences revealed two successive pulses of sand injections : a first one filling N060 fractures and a second one filling the N130 fractures. The first injection process was synchrone to the third increment of compression (s1 striking N030). Some field evidences attest for a persistency of movement on N130 striking dextral faults syn to post injection of the N060 fracture set. The second pulse of injection then fulfilled the N130 set. Ongoing rotation of compression axes then induce the last fault planes responsible for offset of both the injection systems.

6.5.6 (p) Propriétés élastiques des carbonates de type MCO3 : Etude par dynamique moléculaire

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L'étude des propriétés structurales et mécaniques des roches carbonatées est un sujet qui intéresse plusieurs domaines d'ingénierie. Les roches carbonatées sont parmi les principaux constituants des réservoirs pétroliers. Dans ce travail, des simulations de type dynamique moléculaire basées sur la technique de minimisation de l'énergie ont été réalisées sur des structures cristallines des roches carbonatées afin de mieux comprendre leurs propriétés élastiques. Un potentiel interatomique approprié est utilisé pour décrire leurs structures de type rhomboédriques et orthorhombiques.
A la pression atmosphérique, plusieurs propriétés ont été évaluées, y compris les constantes élastiques, module de rigidité, module de Young et les vitesses des ondes transverses et longitudinales. Par la suite, nous avons étudié l'effet d'une contrainte géologique appliquée sur les propriétés structurales et mécaniques de ce type de roches allons jusqu'à 1 GPa, ce qui représente une profondeur de plus de 10km. Notons que certaines de ces propriétés sont mal évaluées.

6.5.7 (p) Vibrométrie laser pour la caractérisation des roches réservoirs

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La reproduction en laboratoire d'expériences de géophysique représente un enjeu particulièrement important, permettant de faire le lien entre les modèles numériques et l'exploitation des données de terrain. Dans