

Dolomitization of Jurassic Carbonates in the Western High Atlas of Morocco: Processes and Implications for Reservoir Properties

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ABSTRACT

Carbonate sedimentation during the Middle to Upper Jurassic along the Moroccan Atlantic margin is marked by the onset of marine conditions in the Callovian within the Agadir-Essaouira Basin. Sedimentation is dominated by bioclastic and oolitic limestones and more distal marls, representing deposition under deeper water conditions. The marls are overlain by Oxfordian coral reefs, which are highly dolomitic and are of particular interest as they constitute the only proven Jurassic carbonate reservoir offshore Morocco, in the Cap Juby field (Tarfaya Basin). The succession is overlain by Late Jurassic succession of reddish marls and dolomite facies followed by peritidal limestones with evidences of emersion. The exact origins and processes for dolomitization are not understood, nor is the impact of dolomitization on reservoir properties. The ongoing research is focused on the sedimentological, climatic, and structural controls on sedimentation. This new study augments this dataset by focusing upon the distribution and origin of dolomitisation. Initial field analysis reveals that Callovian- Oxfordian dolomites are non stratabound, closely related to faults, highly fractured, can smell kerogenous and are oil stained. Moldic porosity and vugs are present and vary in intensity with distance from fault and between different dolomitized facies. Petrographical study reveals the existence of planar, euhedral-subhedral and non-planar, anhedral dolomite textures. In particular, the Callovian succession is replaced with planar dolomites and other limestones are locally completely replaced by dolomite with subhedral- anhedral crystals. A loosely- interlocking network of planar dolomite crystals is found mimetically replacing oolitic and peloidal grainstones of the Oxfordian. Some single, scattered, euhedral dolomite crystals are zoned with clouded centers and clear rims, also found in Oxfordian limestones. This study will integrate outcrop-based sedimentary logging and mapping of the dolomite, and its stratal relationships with detailed petrographical and geochemical analysis. The aim is to determine the processes that govern the presence and distribution of dolomite and assess its impact on reservoir properties. These data will then be used to construct predictive models for dolomitization in Jurassic strata from Morocco that can be extrapolated and applied to offshore exploration.