

Evolution of Stratal Anatomy and Depositional Patterns in a Lower Jurassic Isolated Carbonate Platform Captured by GIS (Djebel Bou Dahar, Southern High Atlas, Morocco)

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The quantification of spatial distribution of lithofacies and their physical properties is fundamental for depositional models, geostatistical analyses, sequence stratigraphy, prediction from seismic reflection data, and flow models for hydrocarbon reservoirs. This paper presents such spatial (GIS, LIDAR and photogrammetry) data acquired from an exceptionally well-exposed, high-relief platform, the Djebel Bou Dahar (DBD), in the southern High Atlas, Morocco. This platform developed in a rift basin and evolved from an extensive shallow platform/ramp system (nucleated above continental and volcanic deposits of Triassic age) into a highrelief and narrower platform during the Sinemurian and Pliensbachian (Early Jurassic), up to the termination due to drowning in the lowermost Toarcian. Synsedimentary extensional tectonics played a major role in controlling the evolution of the platform geometry and architecture that has been into six major stages:

Stages I and II consist of widespread development of shallow marine intertidal and supratidal environments on a several tens of km's wide carbonate system (ramp to shelf) developed under slow and uniform thermal subsidence after Triassic rifting phase. Renewal of extensional tectonics during Sinemurian led to the break up of the previously deposited successions with formation of fault-controlled blocks. The irregular distribution of the tectonically-created accommodation space (due to subsided, rotated, tilted and uplifted blocks) resulted in the development of a progressive narrower carbonate system (stages III to IV). In the final stages (V and VI), a high relief (up to 450 m high from the adjacent basin floor) geometry developed through successive stages of lithofacies retrogradation and platform margin backstepping. Gravitational collapse modified the depositional margin leading to the accumulation of large debris aprons of carbonate debris near the toe of slope. The drowning of the carbonate system in the Toarcian is recorded by a typical drowning succession capped by deep basinal shales.

Keywords: Jurassic, carbonate platform, extensional tectonics, digital outcrop model