Diapiric Controls on Early Jurassic Carbonate Platform Margins of the Central High-Atlas, Morocco

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The spectacular outcrops of the Early Jurassic carbonate platforms of the High-Atlas Mountains (Morocco) are studied in order to analyze the sedimentary evolution of their bioconstructed margins in response to structural deformation associated with salt movement (diapirism). During the Early and Middle Liassic, shallow carbonate platforms developed all over the Atlas intra-continental basin. However, deeper basins characterized by hemipelagic and gravity sedimentation developed locally and at specific times in tectonically-controlled, more subsiding areas. Diapiric movements of underlying Triassic shales and evaporites are associated with active normal and/or strike-slip faults and play a significant role on the complex architecture of the carbonate systems and the platform-basin relationships.

The strongly aggradational pattern of the carbonate system demonstrates an overall important rate of subsidence. This subsidence rate decreases above diapirs and increases above their rims. Several stages of evolution have been differentiated.

1. During the initiation of diapiric movements, the differential increase of subsidence is compensated by carbonate production. This phase is recorded by lateral thickness variations, but no major lateral facies variation.

2. During the paroxysm of diapiric deformations, carbonate production keeps up above diapirs while deeper basins develop along the rims of the diapirs. The relations between platforms and basins present diverse configurations: fault escarpment, erosional slope, forereef slope, distal slope of carbonate ramp. This phase is recorded by both thickness and facies lateral variations. Carbonate platforms with highly aggrading bioconstructed margins (lithiotis, corals, algae,…) are separated by troughs which are sometimes extremely narrow (hundreds of meters), filled by hemipelagic marls and gravity flow deposits.

3. During a period of relative quiescence, carbonate platforms continue to aggrade while the paleo-basins are progressively filled. This passive phase may be recorded by onlap terminations on the platform margin.

4. Finally, the upper Pliensbachian ecological crisis leads to a decrease of carbonate production and the development of mixed carbonate-siliclastics systems (Amezraï Fm.). The decrease of carbonate production leads to a relative increase of water depth, recorded by a transgression at the base of the Amezraï Fm.