

The Sarir (Nubian) Sandstone Sequence in Sirt Basin and its Correlatives: Interplay of Rift Tectonics and Eustasy

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ABSTRACT

The Upper Jurassic-Lower Cretaceous, early syn-rift Sarir (Nubian) sequence in Sirt Basin, Libya, has evolved as consequence of the interplay between global eustasy and regional tectonics. These conditions led to the establishment of a tripartite subdivision of the sequence in most parts of the basin. Members of this subdivision exhibit thickness variation and lateral facies change (that often acquire different local names), attributed to the prevailing syndepositional, structurally controlled basinal palaeotopography. These common depositional themes and controls may change in time and space, due to overprinting by local basement tectonics during rifting. At the basin's central troughs, where maximum subsidence was attained, the Sarir (Nubian) Sandstone sequence is dominated by marine deposits referred to as Cocolith Formation. In the proximity of basement highs, the tripartite sequence are dominated by coarse breasted and meander stream fluvial facies that form major hydrocarbon reservoirs. The Middle Sandstone Member of this division passes laterally into mainly lacustrine shale facies in the adjacent marginal rift troughs. Following the initial development of the Sirt rift system, during the Neocomian-Barremian time, the basin centre was invaded by the Tethyan marine waters; whereas, the marginal areas of the basin were dominated by continental sedimentation. During the Aptian eustatic sea-level rise, overflow of marine water through fault controlled inlets influenced conditions in the marginal troughs by changing the base level, leading to sedimentation of the Middle Shale Member. In wells, the signature of the Aptian eustatic event in the Middle Sandstone Member often went unnoticed due to local erosion and overprinting by tectono-depositional regressive events. Extensive sedimentological study of cores from the Sarir and other key oil fields revealed evidence of the Aptian transgression. The following Albian events were marked by regional reactivation of basement structures leading to regressive fluvial sedimentation of the Upper Sandstone Member throughout Sirt Basin and beyond. In consequence of these shared tectonic and eustatic events and influences, the tripartite division of the Sarir (Nubian) sequence are the common theme not only in Sirt basin but also extend to the Al Jifara, Al Kufrah and Dakhla basins. However, due to its tectonic isolation, the sequence in Murzuq basin is fluvial dominated and, so far, stratigraphically undifferentiated.