The Marrat formation is considered to be one of the most important carbonate oil reservoirs in West Kuwait oil fields area. This work focuses on the regional geology of Marrat based on deep wells in conjunction with 3D seismic data. The paper documents construction of a regional 3D geo-model to understand the geology of Marrat and their bearing on its Petroleum System. Wells and 3D seismic data has been used to identify main structural elements of West Kuwait and their tectonic evolution, particularly since Jurassic period in view of their influence on Marrat basin architecture and depositional fabric. Tectono-stratigraphic analysis of Gotnia Formation has also been carried out to understand the Jurassic Basin evolution through time. The area has four main anticlinal structures namely Abduliya, Dharif, Minagish and Umm Gudair with known multiple Jurassic oil entrapments. These structures were found to be effected by three main compressional forces during the Pre-Jurassic, Jurassic and Cretaceous times.

The Marrat formation was divided into 3 main parasequences, upper, middle and lower. The upper Middle Marrat was further subdivided into 13 sub-layers. The lithology is derived from electro-logs calibrated with cores. Detailed Rock typing was accomplished using neural network technique that resulted in identification of eight carbonate/ evaporate rock types grouped into five litho-facies.

The geological layering based on sequence stratigraphy combined with 3D seismic data provided the framework for structural model while, the litho-facies were propagated in property model honoring well control. This high resolution 3D modeling and visualization proved valuable in interpretation the primary depositional and secondary digenetic processes that left their imprints on Marrat rocks. The porous and permeable aggradational and progadational carbonate parasequences of Middle Marrat constitute the main oil accumulations where reservoir quality is strongly controlled by structure, primary depositional fabrics, as well as extensive dolomitisation.
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