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Clastic Sequence Stratigraphy of Late Jurassic to Early Cretaceous Formations of Jaisalmer Basin, Rajasthan

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Abstract : The Jaisalmer Basin is one of the parts of the Rajasthan basin in northwestern India. The presence of five major unconformities/hiatuses of varying span i.e. at the top of Archean basement, Cambrian, Jurassic, Cretaceous, and Eocene have created the foundation for constructing a sequence stratigraphic framework. Based on basin formative tectonic events and their impact on sedimentation processes three first-order sequences have been identified in Rajasthan Basin. These are Proterozoic-Early Cambrian rift sequence, Permian to Middle-Late Eocene shelf sequence and Pleistocene - Recent sequence related to Himalayan Orogeny. The Permian to Middle Eocene I order sequence is further subdivided into three-second order sequences i.e. Permian to Late Jurassic II order sequence, Early to Late Cretaceous II order sequence and Paleocene to Middle-Late Eocene II order sequence. In this study, Late Jurassic to Early Cretaceous sequence was identified and log-based interpretation of smaller order T-R cycles have been carried out. A log profile from eastern margin to western margin (up to Shahgarh depression) has been taken. The depositional environment penetrated by the wells interpreted from log signatures gave three major facies association. The blocky and coarsening upward (funnel shape), the blocky and fining upward (bell shape) and the erratic (zig-zag) facies representing distributary mouth bar, distributary channel and marine mud facies respectively. Late Jurassic Formation (Baisakhi-Bhadasar) and Early Cretaceous Formation (Pariwar) shows a lesser number of T-R cycles in shallower and higher number of T-R cycles in deeper bathymetry. Shallowest well has 3 T-R cycles in Baisakhi-Bhadasar and 2 T-R cycles in Pariwar, whereas deeper well has 4 T-R cycles in Baisakhi-Bhadasar and 8 T-R cycles in Pariwar Formation. The Maximum Flooding surfaces observed from the stratigraphy analysis indicate major shale break (high shale content). The study area is dominated by the alternation of shale and sand lithologies, which occurs in an approximate ratio of 70:30. A seismo-geological cross section has been prepared to understand the stratigraphic thickness variation and structural disposition of the strata. The formations are quite thick to the west, the thickness of which reduces as we traverse towards the east. The folded and the faulted strata indicated the compressional tectonics followed by the extensional tectonics. Our interpretation is supported with seismic up to second order sequence indicates - Late Jurassic sequence is a Highstand Systems Tract (Baisakhi - Bhadasar formations), and the Early Cretaceous sequence is Regressive to Lowstand System Tract (Pariwar Formation).

Keywords : Jaisalmer Basin, sequence stratigraphy, system tract, T-R cycle
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