

## **Petroleum Systems Modeling to Analyze Conventional and Unconventional Hydrocarbon Potential of Gulf of Mannar, India**

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### **ABSTRACT**

Cauvery Basin is a pericratonic rift basin, on the East Coast of India. The basic architecture consists of en-echelon asymmetric half-grabens, separated by basement horsts. It has 7-8 km thick syn-rift and post rift stratigraphic succession deposited as a consequence of basin evolution since Late Jurassic (164Ma). Presence of Jurassic early/syn-rift facies in southern part of Cauvery Basin comprising Gulf of Mannar has been confirmed through drilling. The northwestern part of study area lies over Mandapam Delft Ridge and the central-south and south eastern part extends into the Mannar Depression which is one of the deepest depositional troughs. M-1-1A, was the first exploration well drilled that had hydrocarbon shows just above K/T, thus proving the presence of an active Petroleum System. Recent wells viz., B-1 and D-1 drilled further south, discovered gas in Turonian and Campanian age intratrapeans. Numerous rift (sub-basin) forming faults and a major NE-SW transform between India and Sri Lanka has been active since Madagascar separation and continues to move and rotate. Accumulations since Cretaceous therefore have remigrated to younger Tertiary sections. 2D- Petroleum System Modeling study along a geological cross section (approx. 138 km) has been undertaken to model paleohistory reconstruction and to assess hydrocarbon prospectivity. It traces the GME cycle and leads to better understanding of hydrocarbon generation, expulsion, migration and accumulation/loss through geologic time to evaluate the possible hydrocarbon proclivity for the Gulf of Mannar. Petroleum System simulations on basis of maturation, indicate that the oldest source rock layer of Jurassic age, went through the oil window in Campanian and gas window at Cretaceous-Tertiary boundary. Conventional hydrocarbon accumulations are observed in Albian, Cretaceous and Paleocene reservoirs in strati-structural entrapment locales. Biogenic potential of Gulf of Mannar has two prime factors - one in favour and one against. Lower heat flux in the range of 45 – 55 mW/m<sup>2</sup> in the Tertiaries, is in favour - as it prolongs biogenic temperature window, while dominantly deep-water depositional settings from Turonian to Eocene are not for favorable organic enrichment. PSM indicates generation in Miocene and younger sediments.