

The Indian Western Margin: An Integrated Assessment of the Petroleum Potential of a Former Hot-Spot

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India's western margin has produced hydrocarbons since the 1970s, but enthusiasm for the area has diminished over the last decade. The thick Deccan Traps, disappointing drilling results in the Kutch and Konkan Kerala Basins and dwindling reserves additions in the Mumbai Basin, in addition to the deep water discoveries on the eastern margin, have resulted in an eastward shift in activity. However, recent licensing rounds have seen uptake of blocks in the Mumbai and Konkan Kerala Basins, suggesting the margin may see a resurgence in activity.

A reappraisal of the tectonics of the Indian sub-continent and the petroleum geology of the coastal basins has attempted to answer critical questions in determining future prospectivity, in particular that of the western margin. Synthesis of gravity and magnetic data, SRTM and Landsat images enabled construction of a detailed structural and tectonic coverage of the region. Quantitative plate modelling tested various scenarios for the tectonic evolution of India and provided the base for a series of palaeogeographic reconstructions, revealing the evolving landscape from the break-up of Gondwana to the collision of India and Asia. For each timeslice the main structural elements, palaeoenvironments and lithologies were reconstructed, providing a visual link between tectonics and source to sink relationships. Superimposed on these were palaeo-digital elevation models and palaeodrainage basins. Analyses of these provide reconstructions of transport pathways connecting source to sink areas, allowing for the prediction of the spatial distribution and quality of source and reservoir rocks.

Geochemical evaluation identified the stratigraphic and regional distribution of potential source rocks and types, and determined depth/temperature thresholds for effective hydrocarbon maturation. All of these steps were consequently integrated to assess each component of the basins' petroleum systems, ultimately allowing determination of exploration risk and uncertainty.

Plate modelling indicates large strike-slip motions occurred between Madagascar and India prior to separation. The importance of this and the influence on prospectivity of 'pre-Deccan' units is discussed. Basin modelling also revealed that mature Tertiary source rocks are mainly absent in the Konkan Kerala Basin. The application of plate modelling and palaeogeographic reconstructions in assessing Late Cretaceous potential source rocks in this basin is demonstrated.