

India Deep Focus – Investigating Sub-Basalt Plays Through Integration of High-Resolution Geophysical Data

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India Deep Focus is a regionally focused integrated project designed to meet industry requests to deliver a regional play fairway analysis of the West coast of India. The India Deep Focus project is an initiative by Fugro to acquire 2D long offset seismic data on the West coast of India, from the Indus Fan in the North to the Mannar Basin in the South.

This project has been carried out in conjunction with the Directorate General of Hydrocarbons (DGH) of India. Innovative seismic processing has provided a dramatic increase in data quality to enable enhanced imaging beneath the Deccan basalts.

The West coast of India is generally regarded as under-explored and current understandings of the region are based on sub-optimal heritage information. The modern data contained within this project, present a fresh understanding and reveals new play concepts especially beneath the basalts.

The India Deep Focus dataset (IDF) consists of long offset, long record length 2D seismic data acquired and processed by Fugro along the west coast of India.

Modelling of high-resolution potential fields data acquired along with the seismic data has aided interpretation of the Deccan Trap basalts. Integration of the potential fields data, with available well data and analysis of regional palaeogeographic evolution based on the Fugro Robertson Plate Wizard™ project has resulted in a coherent understanding of the regional geological history and the identification of a potential deepwater sub-basalt hydrocarbon province.

For a number of years, exploration in the Kerala-Konkan basin has been restricted to the shelf, only recently has attention turned to the deepwater portion of the basin and the possibilities related to sub-basalt sedimentary sequences and petroleum systems. Historically the continent ocean boundary in this area has been the subject of much debate potential fields data indicate areas of low density crust are present beneath the Laxmi Ridge, a known continental sliver, and the Chagos-Laccadive Ridge. Seaward Dipping Reflectors (SDR's) may provide evidence for the location of the COB along the west coast of India. Following interpretation of the IDF seismic it appears these features are not consistently developed between the Chagos-Laccadive Ridge and the Indian mainland. The COB is interpreted to be located to the west of the Chagos-Laccadive ridge.

Basement-rooted half grabens occur across the IDF area beneath the basalt, and a series of Lower Eocene, Middle Eocene and Miocene depositional packages can be interpreted in the post-Trap sequence. Large offset, east dipping, normal faults containing probable Mesozoic-age half-grabens and smaller offset, west dipping normal faults in the hanging-wall blocks are observed. Many of the probable Mesozoic age rift faults have propagated into the Tertiary section.

Towards the end of the Early Cretaceous Gondwana began to fragment with Greater India separating from Antarctica and Africa and was followed by rifting between Madagascar and India. Massive

crustal instability in the proto-Indian Ocean led to the development of a series of competing spreading centres, including the Gop Rift and Carlsberg spreading centre. This period of extension was accompanied by transtension in the Kerala-Konkan basin.

Synthetic Aperture Radar imagery has been used to interpret the presence of seeps and identify areas with an active petroleum system. The seeps identified as potential natural slicks occur beneath a significant syn-rift section and in some cases are associated with faults which were reactivated during the Tertiary. The presence of deep Mesozoic grabens offshore the Kerala-Konkan basin, and evidence of oil seeps, suggests that a previously unrecognized active petroleum system may be present beneath the Deccan Trap basalts.