
STRUCTURAL STYLES AND HYDROCARBON POTENTIAL OF WESTERN KIRTHAR FOLD BELT

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ABSTRACT

The Western Kirthar Fold Belt is a part of a complex structural and tectonic regime located at the western rim of the Indo-Pakistan plate and was developed due to the oblique collision of the Indian Plate with the Eurasian (Afghan Block) during Oligo/Miocene time. It can be described as an inverted passive margin which belongs to highly complicated transpressional deformation system, displaying complex structural geometries with variable components of NS oriented, left-lateral strike slip and east verging compressional deformation structures, with Jurassic to Recent rocks exposed on the surface. Main structures are dominated by the positive inversion of Jurassic and Cretaceous extensional faults; basement is involved and is, therefore, thick-skinned. Shortening is low (Approx 10-20%). Thin skinned deformation occurs at shallow levels. The combined effect of all these components has resulted in the development of the structural features which have significant entrapment potential of hydrocarbons in place in the study area.

The study area (WKSA) covers most part of the Kirthar Fold Belt from northwestern part of Karachi Arc in the south to Kalat Fold Belt and Bolan Area in the north, from Kirthar Complex in the east to Ghazaband and Ornach Nal Faults in the west.

The structural interpretation of the study area has been carried out by interpretation of satellite images, available seismic data and construction of regional structural cross sections. Based on structural complexity of different tectonic elements, the study area has been divided into a number of structural zones. Satellite image interpretation of the study area reveals two main surface anticlinal structural trends, i.e. NNW-SSE in Khuzdar Block swinging toward west in Khuzdar Knot area and NNE-SSW in Kalat Fold Belt and its northern area. The principle compressive stress direction suggested in the area is in NNW-SSE direction resulted from the oblique collision of the Indo-Pakistan and Eurasian plates, which has resulted in the development of NNE-SSW oriented positive inverted anticlinal structures. The major change of the structural trend between Khuzdar and Kalat area is a result of the counter clockwise movement of the Khuzdar Block. This counter clockwise movement has resulted in the development of east verging thin skinned structures of Karachi Arc in the south, opening of the Bela Block and development of the Porali Trough in the west, suggested by the triangular geometry of the Bela Block.

Potential hydrocarbon plays, ranging from Jurassic to Paleocene, have been identified; the main reservoirs in the study area include Spingwar and Chiltan of Jurassic age, Cretaceous Pab and Mughalkot and Paleocene Dunghan Formation. These reservoirs have a potential of several TCF of gas in place. Vitrinitic reflectance data on the main source rocks including Anjira, Sembar and shales of Goru indicate that most of the area is within the gas generation window.