

An Optimistic Approach Towards the Hydrocarbon Potential of Sub-Thrust Zones in the Complexly Deformed Mature Kohat Basin, NW Himalayas, Pakistan

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Abstract

The Kohat Basin of north Pakistan is located within the foothills of the Himalayan orogenic belt, having post-Miocene over thrust deformation styles. It has become a prolific hydrocarbon producing geological province over the last few decades. The petroleum system of the basin is comprised of Jurassic to Paleocene rocks and the oil and gas is mostly trapped within the hanging wall anticlinal closures at a depth range of about 2200 m to 4500 m above major thrust faults. The success ratio of oil and gas discoveries in the Kohat Basin is about 60% which is very encouraging despite of the fact that the quality of seismic imaging is less reliable. The poor quality of seismic imaging is attributed to several factors, such as complex over thrust deformation styles overprinted by transpressional deformation and thick succession of Eocene evaporites and shales that produce disharmony between surface and subsurface structures. To date, all of the oil and gas discoveries in the Kohat Basin are localized within the high side of major thrust faults, whereas their sub-thrust zones are still unexplored. For this study 3D cubes of Manzalai and Makoriand Tolanj fields are analyzed and integrated with the nearby drilled wells in Kohat Basin. It has been found that prominent structural closures in the sub-thrust zones of the Manzalai, Makori and Tolanj oil and gas fields within the Kohat Basin are most likely present. These sub-thrust structures are within the bit range and can open a new deeper level play analogous to the proven high side plays.