

# **Geological Constraints on Central Kohat Foreland Basin, Khyber Pakhtunkhwa, Pakistan: Implications from 2D and 3D Structural Modeling**

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## **Abstract**

An understanding of the spatial arrangement of geological structures is very important to understand their structural evolution and building of a consolidated model for a region. This research is an attempt to understand the structural events of the central Kohat Foreland Basin in 2D-3D workflow, evaluation of multiple decollements and the structural correlation between surface and sub-surface rocks in MOVE SUIT 2015.1. The exposed and sub-surface stratigraphic sequence of Kohat Foreland Basin is divisible into two structural-stratigraphic domains based on the mechanical understanding of the region. These domains are separated by a regional decollements of folding and faulting located at the base of Patala Formation. The rocks of the upper domain, which are comparatively more ductile and are underlain by a thick sequence of shale and evaporites of Paleocene-Eocene, which are deformed into, tight, overturned, doubly plunging and internally faulted anticlines intervened by broad synclines. These east-west oriented surface folds are formed due to detachment thrusting within the Patala-Panoba rocks. The lower domain have a series of north-dipping or south-verging, fault propagation folds incorporating the rocks of Cambrian to Palaeocene, which contains the major hydrocarbon play of the area. A structural disharmony is present in the Kohat Foreland Basin i.e. the structural geometry of surface rocks does not emulate the geometry of sub-surface rocks. The faults in the study area are listric and north or south dipping with a calculated displacement, ranging from 250-2000 meters. The total percentage shortening calculated along the specific lines is 37%. The northwestern part of the study area is relatively more deformed and expose the older rocks. The general rock trend of the central Kohat Foreland Basin deviates from the east-west to the west-north-west as we move from east to the west. Stress analysis of a 3D surface of the Manzalai Ghar Anticline at the level of Lockhart Limestone (-1500 m) is done by using Mohr Stress diagram in MOVE 2015.1 software. The results illustrate positive normal stress values, which suggests the north-south compression related shearing and fracturing in the study area.