Structural analysis of Zindapir Anticline using remote sensing techniques, Eastern Sulaiman Fold and Thrust Belt, Pakistan

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Abstract

Structural discontinuities in rocks like fault, joints, and veins act either as conduits or barriers to the rate and direction of subsurface fluids transport. Detecting and analyzing of these discontinuities can be performed on a variety of scale (from sub-microscopic to regional), and developing their relationship with corresponding fold is important for predicting flow pathway. The present study investigates fold-related mega-fractures network from the Zindapir Anticline by DEM (Digital Elevation Model) analysis derived from SRTM (Shutter Radar Topographic Mission) data of 90m resolution. The anticline is located in the eastern part of Sulaiman Fold-and-Thrust Belt. Fracture analysis of the Zindapir Anticline provides valuable data for reservoir modeling in transpressional setting. The DEM image is processed using Hill shading method to enhance the morphostructural feature visibility in the area. Extraction of bedding planes orientation data across both limbs of the anticline and by subsequent stereographic analysis classified the fold as an asymmetric, upright, doubly-plunging and east-verging structure. The synthesized lineaments map of fractures indicates many fracture sets with varying length (1 to 3.8 km) and orientation. A total of four-hundred and two (402) fractures were marked across the Zindapir Anticline. Nearly equal numbers of mega-fractures are present along the both limbs (204 fractures on eastern limb and 198 fractures on western limb). Fractures/lineaments in this area occur in two distinct regional sets NW-SE and WNW-ESE striking, respectively making oblique and transverse structural relationship with corresponding fold. Longitudinal (extensional) set which are parallel to fold axis and NE-SW oriented set of oblique fractures are rarely observed. Presence of only two dominant sets in NW-SE and WNW-ESE direction may either be related to left-lateral transpression and dragging in the early development stage of the Zindapir structure at the edge of southward propagating Sulaiman Fold-and-Thrust Belt. This research indicates that mapping structural features through DEM can provide fair amount of geological data for understanding of structural findings and modeling of reservoirs on a collision-mountain setting.