Characteristics and Fracture Pattern within the Basement and Cenozoic Rocks and Implication to Reservoir Potential, Red Sea, Midyan Region, NW Saudi Arabia.

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Exploration work has indicated reservoir potential and targets within the Pre-Cambrian Basement and associated sedimentary succession in the Saudi Arabia and surrounding areas in the Arabian Plate. Understanding of fracture, characteristics, and distribution in petroleum basins are essential to improve exploration and production. Fractures are usually the main source for porosity and permeability within basement rocks and it controls the fluid flow. Usage of field outcrop analog studies, are very valuable for estimating the fractures distribution in the subsurface. We conducted an integrated outcrop-based study of the fracture pattern at Midyan Region, NW Saudi Arabia for the aim of identifying the fracture types, pattern and distribution on the Pre-Cambrian Basement rocks and associated Cenozoic sedimentary rocks in the region. The approach and methods used included integrated Landsat analysis and interpretation supported by outcrop based high-resolution observation, mapping and measurements of the fracture within the Basements and the Red Sea Cenozoic sedimentary succession. The Midyan Region has evolved through complex tectonic, structural history where four rifting phases have been reported that associated with several distinctive silici-clastic and carbonate facies and paleoenvironments. The Landsat and outcrop data measurements and analysis of fractures revealed characteristic pattern that generally show NW, NE, NS and EW trends. Some of these trends show similarity to fracture patterns associated with the Najid fault system and the also those associated with the Red Sea tectonic in Midyan region. Moreover, the fracture types within the Cenozoic outcropping rocks tend to correlate with those within the Pre-Cambrian Basement rocks. Fracture distribution was observed also cutting through reservoirs/ seals outcrop equivalents to the subsurface in Midyan region. Integration of outcropping results obtained in this study with subsurface geological and geophysical data and faults and fracture pattern data might provide guide for comparison and enhances prediction for identifying fractured reservoir potential targets, hydrocarbon migration pathways, trapping mechanisms, fracture distribution and modeling.