ANALYSIS OF GEOLOGICALLY FRACTURED TERRAIN USING REMOTE SENSING & GIS

by

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Fractures play an important role in the subsurface movement of water, hydrocarbons and contaminants. The objective is to characterize the spatial heterogeneity of fracture networks in sedimentary rocks using innovative Remote Sensing and GIS techniques. The purpose is to develop new approaches to analyze the spatial distribution of fracture networks, investigate methods for mapping fractures from outcrop photographs or aerial photos and portray spatial distribution of heterogeneity within fracture networks with the aid of a Geographic Information System. The study focuses on quantifying the two-dimensional distribution of fractures and characterizing the geometric attributes of fracture populations in terms of fracture density and connectivity, two important factors that influence fluid flow in fractured rock.

One of the study areas is in Arches National Park of Utah. An aerial photograph in the form of Digital Orthophoto Quadrangle (DOQ) is treated as source data. The methodology includes digitizing fracture traces from air photos within a GIS environment, creating fracture distribution and fracture intensity maps, overlaying maps for quantitative analysis and generating fracture backbone maps.

Characterizing the spatial distribution of fractures is essential, as fractures significantly change the hydrological character and stability of a rock mass. Furthermore, zones of high fracture intensities serve as major pathways for fluid flow, which is of great importance for groundwater exploration and in research fields related to modeling of hydrocarbon reservoirs.