

**Fracture analysis of Jurassic rocks of Nizampur basin, north Pakistan; Implications for tectonic evolution and reservoir potential**

Waqar Ahmed<sup>1\*</sup>, Syed Ali Turab<sup>1</sup>, and Shuja Ullah<sup>1</sup>

<sup>1</sup>*National Centre of Excellence in Geology, University of Peshawar, Peshawar*

*\*Email: geowaqarahmad@gmail.com*

This research presents a comprehensive fracture analysis aimed at assessing the reservoir potential and tectonic stresses influencing Jurassic rock formations. Stress orientation analysis indicates a prevalence of north-south compressional forces, resulting in diverse structural features such as folds, faults, joints, and fractures. Utilizing both 2D and 3D fracture models, we evaluated the permeability and effective porosity of these rocks. Three-dimensional Discrete Fracture Network (DFN) XIII Modeling revealed a deficiency of geometric and genetic coherence among fractures, notably impacting fracture permeability and porosity, particularly at anticlinal limbs. While Jurassic rocks exhibit significant permeability facilitating hydrocarbon migration, their suitability as reservoir rocks is questioned due to generally low fracture porosity. Nonetheless, localized zones with substantial fracture apertures hint at potential reservoir characteristics. Moreover, the decrease in fracture density and connectivity with depth underscores the need for further investigation, utilizing well data and DFN modeling, to better understand fracture interconnectivity in the subsurface.