Fracture analysis of Jurassic to Eocene rocks exposed in the vicinity of Khanpur Dam, Lesser Himalayas, Pakistan

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In an area where compressional tectonics dominates, Fractures are usually formed due to tectonic stresses. Fractures occurring on dipping strata are typically categorized as extension fractures, release fractures, and conjugate fractures based on their relationship with the attitude of the exposed formations and the direction of tectonic stresses. To carry out fracture analysis, a detailed fracture data was collected across the Khanpur Dam area, which exposes Jurassic-Eocene formations, using the Circle Inventory and Scan Line methods. Various characteristics of the fracture sets, such as fracture density and maximum stress direction, were evaluated from the recorded data. Data from each station was used to determine the maximum stress direction (δ1) in the study area. The results show that the Lockhart Formation exhibits significantly higher fracture density compared to the Samana Suk and Margalla Hill Limestone formations. Consequently, the Lockhart Formation, Margalla Hill Limestone, and Samana Suk formations are listed in decreasing order of average fracture density. Out of the 22 stations, the δ1 at 13 stations is oriented in the NE direction, while the remaining 9 stations have it oriented in NW direction, indicating that regional compressional stresses in the study area predominantly align with the north-east and north-west directions.