

Fracture analysis of Siwalik rocks in the vicinity of Zarkai and Takhti Nasrati area, District Karak, Khyber Pakhtunkhwa, Pakistan

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Abstract

The major structure exposed at the eastern side of the Bannu Basin is the Surghar-Shinghar Range. The Range forms part of the Trans-Indus Himalayan Ranges, which are part of the Pakistani foreland fold and thrust belt. The Surghar-Shinghar Range forms an anticlinal structure and can be divided into two regional domains based on its geographical extension. The northern domain stretches from the Kalabagh in the east and Takhti Nasrati in the west, where the range forms an ENE-WSW structure, whereas the southern domain extends from the Qabul Khel in the south to Takhti Nasrati in the north, where the range forms an almost N-S structure. Thus, the Takhti Nasrati forms a prominent structural bend in the range. The purpose of this study is to understand the geometric relationship of fractures to the Thatti-Nasrati bend. Detailed fracture analyses were conducted using standard scanline and inventory circle techniques. All the fracture properties were recorded including fracture length, aperture, attitude and density. Average aperture size of extension fracture is estimated around 10mm, whereas the average density of fractures in terms of their length within the inventory circle is 0.07cm⁻¹. Attitude data of fractures show that there at least three geometric patterns that can be linked to the regional anticlinal structure, in general, and to the Takhti-Nasrati bend, in particular. These are longitudinal, cross and oblique fractures with respect to the fold. The longitudinal fractures are perpendicular to the bedding and parallel to the regional fold axis. The cross fractures are perpendicular to the regional fold axis, whereas the oblique fractures are at low-to high angle to the fold axis. The geometry of these fractures is compatible with the published fold-fracture models.