Outcrop Fracture Pattern and Paleostress Analysis of the Ghumanwan Dome, Hazara Basin, NW Himalayas, Pakistan

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Hazara Basin is a NE-SW trending fold and thrust belt, emerged as a consequence of ongoing collision between the Indian and Eurasian plates. Hazara Basin is bounded by Panjal Thrust (PT) in the North and Main Boundary Thrust (MBT) is located in the South. The present work deals with the paleostresses and outcrop fracture pattern (orientations, opening, fracture density) in different rock units exposed in Ghumanwan area located in the vicinity of Abbottabad, in Hazara Basin. PT and MBT juxtapose various lithological units along the Hazara Kashmir Syntaxes (HKS). The imbricate fault system between these two faults indicates a sinistral relative movement. We adopted circle inventory method in the field and collected data (fracture length, width, orientations and dip azimuth) from diverse rock units at 11 visited outcrop stations of the Ghumanwan Dome. These rock units include Upper Cretaceous (Kawagarh Formation) and Paleogene carbonates (Lockhart Formation and Margalla Hill Limestone). We observed highly dense, non-systematic fracture pattern in which mostly fractures are oriented in N-W direction normal to the bedding. Moreover, MOVE™ 2018 (Midland Valley) Stress Analysis module (Stereonet Plot) was used for paleostresses analysis. The results show that the Slip Tendency (ratio of shear stress to normal stress) magnitude of $\sigma_2$ lies closer to the $\sigma_3$ (on Stereonet) and suggests compressional stresses in which NW-SE oriented fractures developed. The N-S compressive stresses which have mainly affected the concerned area are presumably linked to be late Eocene-Oligocene tectonic event.