REMOTE SENSING AND DIGITAL TERRAIN MODEL (DTM) BASED INVESTIGATIONS REVEAL RECENT CRUSTAL ADJUSTMENTS IN SOUTHERN KUMAUN HIMALAYA, INDIA

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Abstract: Himalaya mountain chain has evolved as a result of continent-continent collision between India and Asia. The collision is still active and the present study is aimed at understanding its recent repercussions on the southern Himalayan terranes. Qualitative and quantitative morphotectonic approaches have been applied for this. However, field based morphotectonic investigations in the Himalaya are generally impeded due to inaccessibility to large tracts of its rugged and thickly forested mountains. Thus, the present investigations are based on interpretation and analysis of LISS III optical data from Indian Remote Sensing Satellite (IRS) and DTMs derived from relief information given in toposheets.

Overlooking the vast Ganga Plain, the study area encompasses the low dissected, denudo-structural Siwalik hills in the south and highly dissected, denudo-structural Lesser Himalayan hills in the south. The longitudinal Himalayan Frontal Thrust (HFT), Salari Thrust (ST), Main Boundary Thrust (MBT) and Ramgarh Thrust (RT) and many transverse faults, subdivide the mountain mass into three Lesser Himalayan and one Siwalik tectonic blocks.

Geomorphic features such as paired and unpaired river terraces, triangular fault facets, escarpments, train of landslides, entrenched rivers, anomalies along the river courses and drainage patterns indicate tectonic unrest in the region due to activities along all the block defining faults/thrust driven by collision generated stresses. Morphology of hill-slope facets, drainage pattern, drainage deflections and drainage texture, augmented by Basin Asymmetry Factor (AF) and Transverse Topographic Symmetry Factor (T) of 44 drainage basins, and Valley-floor Width-to-Height Ratio (V_f) and Mountain-front Sinuosity (S_{mf}) along the mountain-front reveal the collision generated stresses have caused gentle to steep tilting of all the four tectonic blocks of the area. Further, the Lesser Himalayan tectonic blocks are generally northerly to easterly reclined due to uplift along the block defining thrusts, whereas the Siwalik tectonic block is westerly reclined due to its differential uplift along the range-bounding Himalayan Frontal Thrust (HFT). High density and frequency of mass wasting incidences and recurrent seismic activities suggest high geohazard vulnerability along inter-block boundaries .

Keywords: Geomorphology, Tectonics, Geohazard, DTM, IRS LISS 3 image.