

Tectonics of Out-of-Sequence Thrusting in NW Himachal Himalaya, India

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Abstract : Jhakri Thrust (JT), Sarahan Thrust (ST), and Chaura Thrust (CT) are the three OOST along Jakhri-Chaura segment along the Sutlej river valley in Himachal Pradesh. CT is deciphered only by Apatite Fission Track dating. Such geochronological information is not currently accessible for the Jhakri and Sarahan thrusts. JT was additionally validated as OOST without any dating. The described rock types include ductile sheared gneisses and upper greenschist-amphibolite facies metamorphosed schists. Locally, the Munsiri (Jutogh) Thrust is referred to as the JT. Brittle shear, the JT, borders the research area's southern and ductile shear, the CT, and its northern margins. The JT has a 50° western dip and is south-westward verging. It is 15-17 km deep. A progressive rise in strain towards the JT zone based on microstructural tests was observed by previous researchers. The high-temperature ranges of the MCT root zone are cited in the current work as supportive evidence for the ductile nature of the OOST. In Himachal Pradesh, the lithological boundaries for OOST are not set. In contrast, the Sarahan thrust is NW-SE striking and 50-80 m wide. ST and CT are probably equivalent and marked by a sheared biotite-chlorite matrix with a top-to-SE kinematic indicator. It is inferred from cross-section balancing that the CT is folded with this anticlinorium. These thrust systems consist of several branches, some of which are still active. The thrust system exhibits complex internal geometry consisting of box folds, boudins, scar folds, crenulation cleavages, kink folds, and tension gashes. Box folds are observed on the hanging wall of the Chaura thrust. The ductile signature of CT represents steepen downward of the thrust. After the STDSU stopped deformation, out-of-sequence thrust was initiated in some sections of the Higher Himalaya. A part of GHC and part of the LH is thrust southwestward along the Jutogh Thrust/Munsiri Thrust/JT as also the Jutogh Nappe. The CT is concealed beneath Jutogh Thrust sheet hence the basal part of GHC is unexposed to the surface in Sutlej River section. Fieldwork and micro-structural studies of the Greater Himalayan Crystalline (GHC) along the Sutlej section reveal (a) initial top-to-SW sense of ductile shearing (CT); (b) brittle-ductile extension (ST); and (c) uniform top-to-SW sense of brittle shearing (JT). A group of samples of schistose rock from Jutogh Group of Greater Himalayan Crystalline and Quartzite from Rampur Group of Lesser Himalayan Crystalline were analyzed. No such physiographic transition in that area is to determine a break in the landscape due to OOST. OOSTs from GHC are interpreted mainly from geochronological studies to date, but proper field evidence is missing. Apart from minimal documentation in geological mapping for OOST, there exists a lack of suitable exposure of rock to generalize the features of OOST in the field in NW Higher Himalaya. Multiple sets of thrust planes may be activated within this zone or a zone along which OOST is engaged.

Keywords : out-of-sequence thrust, main central thrust, grain boundary migration, South Tibetan detachment system, Jakhri Thrust, Sarahan Thrust, Chaura Thrust, higher Himalaya, greater Himalayan crystalline

Conference Title : ICSSSG 2023 : International Conference on Soil Stability and Structural Geology

Conference Location : Vancouver, Canada

Conference Dates : August 03-04, 2023