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Tectonics of Mountain Front, Western Himalaya

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Southernmost mountain ranges, Siwaliks of SubHimalaya, abut against the Indo-Gangetic plain with an abrupt physiographic break. The boundary between the mountain front and the alluvial plain is demarcated by the Himalayan Frontal Thrust (HFT). This thrust represents an active zone of deformation along which principal tectonic displacement takes place between the northward converging Indian continent against the Himalaya. The HFT is observed to override the Holocene to Recent sediments dipping ~ 30^{o}NE. The fluvial strath terraces, located 20-30 m above the present day streams levels, have been uplifted as a result of displacement over the underlying southward propagating HFT. The dating of some of these terraces have indicated average convergence rate of 15 mm/yr and uplift rate of 6 mm/yr during Holocene. The surface ruptures of large to great magnitude earthquakes have been reported in trenches excavated for paleoseismological study at several localities along the HFT in western Himalaya. In front of the Siwalik ranges, south of HFT, lies the 15-20 km wide piedmont zone. The piedmont zone, formed by coalescing fans derived from the Siwalik ranges, is characterized by uplifted and undulating topography with streams incision varying 2-10 m. The piedmont zone is uplifted 10-15 m as a result of displacement over the Piedmont Fault (PF) post-dating 4.8 Ka. The PF is expressed as scarp or may remain a blind thrust in some cases. The PF is a step out thrust from the HFT, indicating a wide zone of active thrust faulting and uplift. The GPS measurements indicate 100 km wide segment across the HFT zone to Lesser Himalaya is locked wherein no convergence is recorded. The instrumental microseismicity underneath the topographic front of High Himalaya suggests interseismic elastic strain is accumulating in the mid-crustal ramp region. The accumulated strain is released by a slip that propagates southward over the underlying Plate boundary fault. The active tectonic deformation observed as permanent displacement along the HFT zone is interpreted as representing slip along the decollement to range front as a result of major to great earthquakes.