

## Late quaternary Neotectonic evolution of dun in Garhwal Sub Himalaya

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Dehra Dun is 80 km long 20 km wide valley within the Siwalik foreland basin of Garhwal Sub-Himalaya, bounded by the frontal Siwalik range to its south and the Lesser Himalayan Mussoorie range to its north. The base of the Mussoorie range is demarcated by the Main Boundary Thrust (MBT) that brings the late Proterozoic-Cambrian sequence of Lesser Himalaya to override the Siwaliks. To the south a sudden topographic rise of the frontal Siwalik range from the alluvial plain marks the Himalayan Frontal Thrust (HFT) that separates tectonically the Siwalik Group strata from the Holocene to recent alluvial sediments. In his pioneering work, Nakata (1972) recognized four levels of geomorphic surfaces. In Dun the Siwalik Group strata are folded and eroded, and are overlain by 100-300 m thick Dun gravels. The post-Siwalik Dun gravels are lithostratigraphically classified into four units: Unit A, Unit B and Unit C in northern part and Unit D in southern part of Dun. Based on earlier published OSL dates (Singh et al. 2001), the assigned ages are: > 40 Ka for Unit A, 29 Ka-22 Ka for Unit B and 10 Ka and younger for Unit C.

In northern part of Dun the Siwalik Group strata are exposed in two different tectono-geomorphic framework: the dissected Siwalik and the pedimented Siwalik, the former has uplifted topography with isolated cover of Dun gravels whereas the later are exposed in entrenched stream sections overlain by thick cover of Dun gravels. The dissected and uplifted Siwalik constitutes the hanging-wall and the pedimented siwalik forms the foot-wall of the Santaugarh Thrust (ST). The Unit A of Dun gravels, occurring as tilted beds dipping NE 15°-45° to horizontal and overlying the eroded and steeply dipping Siwalik, represent synorogenic deposition related to growth of the Santaugarh anticline. The Santaugarh anticline, an overturned fold, facing

south with steeply to moderately dipping limbs was developed as fault-propagated fold over the ST. In the frontal Siwalik range Mohand anticline was developed as fault-bend fold over the HFT. The Mohand anticline is an upright and asymmetric fold with steep dipping forelimb and gentle dipping to horizontal back limb. On the range front the strath terraces occur at ~20 m elevation, and the Siwalik strata dipping NE 30° over the older alluvium are exposed in a trench. These observations indicate active displacement ongoing in Holocene time. South of the HFT, ~15 km wide piedmont zone is uplifted to 10-15 m elevation as evidenced by remains of uplifted topography, entrenched streams and a topographic rise from flood plain towards the HFT. The uplift of piedmont zone is attributed to a blind fault emerging as imbricate of the southward propagating HFT. Based on earlier published OSL dates and our newly obtained OSL dates, age constraint is placed on the tectonic events. The HFT was initiated during interval between 500 ka and 100 ka. The ST was initiated post- 500 ka and continued its activity as young as post- 40 ka. The Bhauwala Thrust and Majhaun Fault were developed between 29 ka and 22 ka, and the Asan Fault post-dated 10 ka. The upliftment of the piedmont zone post-dated 5 ka and probably coseismic.

### References

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