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Records of 10 Ma thrusting events in the Himalayan foreland sediments, Kangra sub-basin, India: Detrital modes and geochemical proxies

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Detrital modes and geochemical proxies supported by sedimentation patterns of Late Neogene(11.3- 5.5 Ma) coarsening up fluviatile Siwalik succession in Kangra sub-basin, a part of Himalayan Foreland Basin, has been attempted to understand the role of the Chail thrust (CT) activity at about 10 Ma. The succession consists of dark grey sandstone interbedded with purple mudstone in lower part, overlain by salt- and pepper grey sandstone and variegated mudstone, and capped by thickly bedded conglomerate with minor amount of coarse-grained sandstone and mudstone. The sedimentologic parameters show change in palaeochannel pattern from meandering to braided and inception of alluvial fan settings at the terminal phase. On the basis of temporal variations in detrital modes, two petrozones - PZ-1 (between 0 - 750 m stratigraphic interval; 11.3 to 9.5 Ma) and PZ-2 (between 751-1934 m stratigraphic interval; 9.5 - 5.8 Ma) were identified. The present model proposed that during the early phase of Chail Thrust (CT) activity i.e., prior to 10 Ma, the depocenter has witnessed high amount of sedimentary fragments mainly from the Lesser and Sub-Himalayan exposed on the footwall of the Chail Thrust whereas after 10 Ma, the contribution from the hanging wall of the Chail Thrust comprising mylonitic augen gneiss and low grade metamorphites increase along with the arenaceous and basic materials from the Lesser Himalayan footwall region, possibly responsible for lowering of the K_2O/Na_2O ratio. Consistent proportion of quartz and feldspar and total clay, between 11.3-9.5 Ma suggest chemical weathering was intense and 9 Ma onwards, the physical weathering exceeds chemical weathering. A mixed source has been observed between 10-9 Ma. The rise of Al_2O_3/TiO_2, MgO/CaO and K_2O/Na_2O ratio from 9.5 Ma onwards may be due to the rapid upliftment of the Dhauladhar granites. The variation in the detrital modes and elemental ratios pertinent to the 10 Ma active phase of the Chail Thrust is coincidental with drainage re-organization and enhanced net sediment accumulation rates.

Keywords: Himalayan foreland basin, Kangra sub-basin, detrital modes, geochemistry, 10 Ma