Central Crystallines as the Exclusive Source Terrain For The Sandstone-mudstone Suites Of Siwalik Group: Geochemical Evidence

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The major, trace and rare earth element composition of a sandstone – mudstone suite provide necessary information needed for interpreting the characteristic of its provenance. In the Siwalik sedimentary basin, compositional change is a functions of stratigraphic height. Chemically this factor is demonstrated by an upward increase in the oxide concentrations of P, Na, Ca, Mg and Si, from Lower to the Upper Siwalik. At the same time, concentration of oxides of K, Fe, Ti and Al show marked fall with the increasing stratigraphic age. Such trends clearly reflect time-controlled changes in the rock type in the source terrain. Ratios of Eu/Eu* (~ 0.65), (La/Lu)cn (~ 9.04), La/Sc (~ 3.79), Th/Sc (~ 1.54), La/Co (~ 3.59) and Cr/Th (~ 2.26) suggest prominence of felsic source area for the Siwalik mudstones and sandstones. Chondrite normalized REE pattern with LREE enrichment and moderately flat HREE pattern with sharp negative Eu anomaly can be is clearly assigned to felsic rocks in the source area. Our analytical data set practically rules out any contribution by the mafic rocks of any kind as inferred in the previous workers. This is a significant departure from the general belief about the source area chemistry. Our analytical results highlight the compositional similarities of Siwalik sediments with the crustal proxies like PAAS, NASC and UCC. Furthermore, large-scale Precambrian and early Paleozoic granitic activity in the Himalayan tectogene seems to have played much more significant role in shaping the composition of the foreland sediments. The variable CIA values (71-87) and marked depletion in Na, Mg and Ca exhibited by the Lower, Middle and Upper Siwalik sediments reflect the effect of variation in the climatic zones and in the rate of tectonic uplift of the source area. By the time Siwalik sedimentary prism was deposited, there seems to have existed sufficient orographic barriers to produce significant moisture to intensify weathering coupled with intense tectonic activity. Our results demonstrate that in the Lower Siwalik and a part of Middle Siwalik, Higher Himalayan crystalline sequences (HHCS) acted as the primary source area with minor contributions from the metasedimentry succession of the Lesser Himalaya. Later, during the deposition of the upper part of Middle Siwalik and the Upper Siwalik, the source terrain switched positions. These two prominent source terrains supplied sediments in steadily changing proportion through time.