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Geochemistry of Himalayan foreland sediments using modern soil chemistry as proxy: Constrain on provenance

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Rare earth element (REE) chemistry of the Neogene Siwalik Group of sediments and modern soils, along with their major and trace element composition are presented to establish a backward-forward linkage between sediment and soil chemistry, to interpret the style of geochemical fractionation using several pathfinder elements that inherited the signatures of provenance and source terrain weathering condition. The geochemical attributes, supported with petrographic modal analysis suggest that the Siwalik sandstone and consequent soils were formed in passive-margin tectonic domains, having moderate to intense weathered source terrains. Provenance sensitive elements e.g. REEs, Th, Sc and some of the critical elemental ratios like Eu/Eu*, La/Sc, Th/Sc, La/Co, and Cr/Th of sediments and soils treated *at par* suggest felsic make up of source terrain. In spite of secondary biogeochemical pedogenic processes, soils do retain the uniformity in REE distribution. The chondrite normalized distribution pattern for the soils follows similar trend as depicted by the sediments, which retains the typical post-Archean REE pattern (enriched LREE and flat HREE) and the negative Eu anomaly, transferred from the source terrain. It is true that some enrichments in ∑ REE (~ 10%) and LREE/HREE ratios in the soils reflect grain size bias. In addition, ratios such as Zr/Sc, Th/U and series of plots involving Zr, Hf, Sc and Th suggest significant contribution from heavy minerals especially zircon, which reflect coherent progression of elemental fractionation from sediments to soils, and retaining the signature of pathfinder elements and overall geochemical make up.