Sedimentary provenance and paleoclimatic reconstruction using drill cores from the Kosi megafan, India

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The Kosi megafan is a well-known Himalayan megafan formed due to high sediment delivery of Kosi River and frequent migration of the trunk river at least since MIS 4. Several cycles of aggradation with lithological discontinuities are recorded in the sedimentary succession recovered through drill cores suggest that near-surface (~20 m) strata of the megafan consist of large amalgamated sand bodies with have pockets of mud and silt whereas shallow sub-surface (~50 m) deposits are largely sandy and devoid of mud and silt pockets. We have recorded five cycles of channel activity: (i) > 65ka (MIS4), (ii) 32 to 50ka (MIS3), (iii) 12 to 28ka (MIS2), (iv) 9 to 11ka (Early Holocene), and (v) 5ka to Modern (Late Holocene) in the studied cores. Multiple aggradational events and discontinuities due to migration of the river match with the major climatic shifts manifested in geochemical proxies, which in turn influenced the sediment flux from the Higher/Lesser Himalaya. Proximal to distal progradation of the megafan reflects gradual decrease in flow energy through time or change in sediment supply from the hinterland. Isotopic composition ($^{87}Sr/^{86}Sr$: 0.7785 to 0.8592; ε_{Nd}: -21.2 to -17.8) of Kosi core sediments are the most radiogenic reported so far in the Gangetic basin, and also suggest binary mixing of sediments contributed from both Higher Himalayan (HH) and Lesser Himalayan (LH) sources. Down core isotopic variability shows variation in sediment provenance due to major climatic shifts - high $^{87}Sr/^{86}Sr$ and low ε_{Nd}characterize the interglacial period whereas low $^{87}Sr/^{86}Sr$ and high ε_{Nd}dominate the glacial period. This is attributed to the litho-tectonic setting of the Kosi basin wherein deformed sequence of Himalayan zone exposes the HH rocks at a lower topographic level.