Geochemistry of buried river sediments from Ghaggar Plains, NW India: Multi-proxy records of variations in provenance, paleoclimate, and paleovegetation patterns in the Late Quaternary - DTU Orbit (09/11/2017)

Geochemistry of buried river sediments from Ghaggar Plains, NW India: Multi-proxy records of variations in provenance, paleoclimate, and paleovegetation patterns in the Late Quaternary

We report the first geochemical record in two drill-sediment cores from a buried channel in the Ghaggar Plains of NW India, which are used to infer variations in provenance, paleoclimate, and paleovegetation in the locality during the Late Quaternary. Aeolian sediments (~150 ka) in both the cores are overlain by fluvial sediments (~75 ka-recent). Major oxide compositions of the core sediments (n = 35) generally vary between that observed for the modern-day Ghaggar/Sutlej and Yamuna river sand. The isotopic composition (87Sr/86Sr: 0.7365 to 0.7783 and εNd: -14.6 to -19.0) of core sediments (n = 18) suggest binary mixing of sediments from compositionally distinct Higher Himalaya (HH) and Lesser Himalaya (LH) endmembers in the catchment, and support involvement of a river system originating in the Himalayan hinterland. Distinctly higher 87Sr/86Sr and lower εNd in the core sediments during glacial periods can be explained by increasing sediment contribution from LH (high 87Sr/86Sr and low εNd) due to an increase in glacial cover over HH. Whereas relatively less glacial cover over HH during interglacial periods resulted in more erosion and sediment contribution from HH. The down-core Sr-Nd isotopic variability clearly reflects climate-controlled sediment erosion in the Himalayan catchment. Temporal variations in δ18O and δ13C of carbonate nodules (n = 27) are consistent with that reported from the Ganga interfluves. The δ13C variability (-4.1‰ to 1.2‰) in carbonates is mainly controlled by the extent of silicate (HH) versus carbonate (LH) source weathering due to significant climatic shifts. The δ13C of sediment organic matter (-27.4‰ to -23.2‰, n = 24) suggests dominantly C3 plants in the catchment during the last ~75 ka. More negative δ13C values in sediments during glacial periods relative to those during interglacial periods can be explained by increasing C4 abundance during interglacial periods characterized with both higher summer rainfall and mean annual temperature.

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