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Late Quaternary alluvial stratigraphy of the Ganga basin

R. SINHA[1], S.K. TANDON[2], M.R. GIBLING[3], P. S. BHATTACHARJEE[1] and A.S. DASGUPTA[1]

[1]*Engineering Geosciences Division, Indian Institute of Technology Kanpur 208018, India*
[2]*Department of Geology, University of Delhi, Delhi 110007*
[3]*Department of Earth Sciences, Dalhousie University, Halifax, Nova Scotia, B3H 3J5, Canada*

The alluvial deposits in the Ganga basin provide one of the most significant continental records for understanding the interplay of climate, tectonics and eustatic changes in generating thick sedimentary fills in a monsoon-dominated foreland system. This paper reports new results based on studies of river cliff sections and shallow boreholes down to ~50 m depth. We have investigated the history of valleys and interfluves over the past 100 ka in the Kanpur region of Uttar Pradesh The stratigraphic framework is supported by OSL and radiocarbon dates, as well as magnetic susceptibility profiles and claymineral analysis. Our data suggest that the alluvial succession in the Ganga plains are marked by strong discontinuities manifested in moderate pedogenesis and calcrete development. The interfluve areas have been 'attached' and 'detached' to the main river during the last ~25-30 ka and the detachment phases are represented by swamp or eolian facies over the floodplain. The valley cores contain channel belts attributed to the paleo-Ganga, which yield dates of 26 ka and 6 ka. The Ganga was close to its present position at 26 ka and probably accumulated channel and floodplain sediment until precipitation and discharge were greatly reduced during the Last Glacial Maximum (LGM). The rivers started incising in response to increased water budget between 15-5 ka thereby producing the high cliffs at several locations in the Ganga plains. This observation is at variance with the present understanding that the dominant control of cliff incision is tectonics and not climate.

Despite its location only 10 km from the Ganga Valley, the 50 m interfluve core consists entirely of floodplain fines that date back to about 86 ka. The interfluve appears to have been a site of floodplain accumulation from small plains-fed channels over this period, during which Himalayan and plains-fed channels appear to have occupied separate floodplain tracts, with large parts of the plains detached from the direct effects of the big rivers. The interfluve floodplains were sites of more intense pedogenesis, and accumulated through cycles of aggradation and soil formation, possibly in response to monsoonal fluctuations on a timescale of 10^3 to 10^4 years.