AOGS 2005

Incision of alluvial rivers in the Ganga plains, India: interplay of climate, tectonics and glacioeustasy

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An integrated investigation of the Late Quaternary alluvial sequences in the Ganga plains suggests that tectonics, climate and glacioeustasy have influenced valley and floodplain architecture in different parts of the plains stretching from the frontal areas to the delta. Near the Himalayan Front, where major faults are active, tectonic and climatic effects are the dominant factors in valley formation. Climate was an important factor near the craton margin in the western plains, where tectonic activity is minor and subsidence rates are moderate. Age models for this region suggest that discontinuitybounded sequences over timescales of 10^3 to 10^4 years formed in response to variations in monsoonal precipitation and fluid and sediment discharge in the rivers. However, modern megafans and interfan rivers of the eastern plains of north Bihar are not incised, probably due to high sediment yields and low unit stream power. Although long-term records are sparse, discontinuities are probably uncommon in this area. In the Ganga-Brahmaputra Delta region, the channels are not presently incised, but sea-level fluctuations generated thick late Pleistocene valley fills that extend several hundred kilometers inland. Many Himalayan and cratonic rivers across the area experienced Early Holocene incision in response to monsoon intensification following the Last Glacial Maximum, and brought a large sediment load to the delta and the Bengal Fan.

Many reaches in axial parts of the Ganga system appear to have migrated progressively southward in the recent past, generating cliffs along their southern valley margins. Such systematic migration reflects collision of India and Asia and resulting uplift at the Himalayan Front. Climatically controlled sequences may be superimposed on this long-term valley migration, which should generate diachronous valley-base surfaces. Valleys on inland alluvial plains may vary from prominent to subtle over short periods, as well as avulsing periodically and migrating systematically.