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Evolution of the rivers in the western Thar Desert since the LGM traced by U-Pb zircon ages

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Satellite imagery has for a long time shown the existance of dry or emphemeral streams on the western edge of the Thar Desert, that have been associated with the legend of a river flowing parallel to the Indus in this region in the pre-historic past. In this study we sampled sandy overbank and channel sediments by trenching and shallow coring in the flood plain of the Indus, adjacent to the Thar Desert. Age control was provided by 14C AMS and optically stimulated luminesence methods. The U-Pb age of zircon grains in the sands were measured by laser ablation ICP-MS. Characterization of the zircon age populations in modern sediment from the major Indus tributaries and the adjacent Ghaggar-Hakra and Yamuna allows ready comparison with the palaeo-river sediments. Zircon grains from Holocene sediments show significant differences with the Sutlej and Ghaggar-Hakra, which now flow closest to the study region, suggesting a recently evolving river system. Some sediments show strong reworking from Thar Desert dunes. One site (Tiwalla) shows a prominent 400–500 Ma population, suggestive of a direct connection to the Beas River, independent of the Sutlej, which it now joins close to the mountain front. At another site (Marot) the sands have a large population of 1850–1900 Ma grains that are like those found in the Sutlej, but are most similar to the modern Yamuna. These data suggest that the Yamuna's present course connecting into the Ganges is a recent development and that this stream previously flowed west into the Indus. Our data suggest that in the Early-Middle Holocene several rivers that now flow further north and west converged in the western Thar Desert region. Their progressive loss may be one of the major triggers in driving the dispersal of the Harappan Civilization from this region, especially at the end of the Mature Urban Phase after 1900 BCE.