



## **High Preservation Supercritical Flow Stratification: Luni River, Thar Desert, Western India**

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Upper-stage bedforms and the resultant stratigraphy are rarely well-preserved in the geological record. However, thick units of upper-stage bedding occur frequently within the stratigraphy of Luni River, Thar Desert, India, interbedded with units of lower-stage dune stratigraphy. This presentation explores the depositional setting and the hydraulic controls that result in the preservation of upper-stage stratigraphy. A 700m-wide section, 5m deep, was logged and photographed and the luminescence-dated stratigraphy related to the flow regimen. Seasonal discharges may reach 14,000 m<sup>3</sup>s<sup>-1</sup> but the bed is dry for most of the year. The deposits consist mainly of sandy upper-stage plane bed lamination and low-angle stratification deposited in supercritical flows with some strata showing gravel-lense antidune signatures. Estimated hydraulic parameters based on recorded hydrographs indicate a dominance of the upper-stage plane bed state due to steep channel gradients. Less frequent dune trough cross-sets occur at all depths, yet commonly as a distinct set with an erosive upper-boundary. Localized massive deposits may occur laterally adjacent to upper-stage and lower-stage units due to rapid deposition in deep scour holes. Deep scour also causes soft-sediment deformation due to slumping of the scour hole margins. Repeated deep scour results in units of deposition of different ages (50 to 500 a BP) found at similar shallow depths (2-3m). Older dates (1-2 ka BP) occur in lower strata (4-5 m depths) at which depths younger units also are locally preserved. Quaternary uplift caused channel incision and led to a relatively narrow, constrained, steep channel enhancing flow speeds and the development of upper-stage bedforms. However, recent aggradation is a significant control leading to upper-stage stratigraphy preservation in an otherwise low accommodation-space fluvial system. These results should help improve understanding of the stratigraphic development in trans-critical flows and in modern dryland rivers in particular.