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# Lowland river responses to intraplate tectonism and climate forcing over the last glacial cycle

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Intraplate tectonism has produced large-scale folding that steers regional drainage systems, such as the 1600 km-long Cooper Creek, en route to Australia's continental depocentre at Lake Eyre. We apply cosmogenic exposure dating (10Be and 26Al) in bedrock, and luminescence dating in sediment, to quantify the erosional and depositional response of Cooper Ck where it incises the rising Innamincka Dome. The detachment of bedrock joint-blocks during extreme floods governs the rate of incision ($\sim$17 $\pm$ 8 mm/ky), estimated using a numerical model of episodic erosion calibrated with 10Be and 26Al. The last big-flood phase occurred $\sim$120–110 ka. Upstream of the Innamincka Dome long-term rates of alluvial deposition, partly reflecting synclinal-basin subsidence, are estimated from 47 luminescence dates in sediments accumulated since $\sim$270 ka. Sequestration of sediment in subsiding basins such as these may account for the lack of Quaternary accumulation in the Lake Eyre depocentre. Over the period $\sim$75–55 ka Cooper Ck changed from a bedload-dominant, laterally-active meandering river to a muddy anabranching channel network up to 60 km wide. We propose that this shift in river pattern was a product of base-level rise linked with the slowly deforming syncline-anticline structure, coupled with a climate-forced reduction in discharge. The uniform valley slope along this subsiding alluvial and rising bedrock system represents an adjustment between the relative rates of deformation and the ability of greatly enhanced flows at times during the Quaternary to incise the rising anticline. Hence, tectonic and climate controls are balanced in the longer term.