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Fluvial adjustment to changing base-level and climate over the last glacial-interglacial cycle in sub-tropical Australia

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Continental-margin fluvial systems are often found to be under the influence of both upstream (climate) and downstream (sea level) controls. In Australia, relatively little is known about fluvial adjustment in the upper reaches of large continental drainage systems. In the tectonically-stable setting of eastern Australia, climate is typically seen as the dominant factor governing fluvial response over the timescale of Quaternary glacial/interglacial cycles. This study uses a 30m record of valley alluviation in the lower reaches of Lockyer Creek, a key tributary of the mid-Brisbane River in SEQ, to document (a) the timing of fluvial response to both sea level and climate change, and (b) the nature of the river's response to that change, over the past 230 ka. Chronostratigraphic units within the deep valley fill sequences reveal seven phases of channel incision and aggradation spanning the past 230 ka. The lateral and vertical extent of major valley fill units indicates a switch in depositional style from valley-wide coarse bedload deposition to narrower channel belt, fine-grained aggradation sometime after 120 ka. The preservation of multiple-age channel deposits across the wide valley floor indicates successive channel avulsion over this time-scale. Episodes of channel incision are reasonably aligned with sea level low stands during Marine Isotope Stage (MIS) 7, 6 and 3 where incision to bedrock over depths of 25 to 30 m occurred. However later episodes of channel incision dated to between 27-12 ka either pre-, or post-date the last glacial low stand. The majority of the valley fill in the lower Lockyer consists of fine-grained alluvia which reflect restricted lateral channel mobility due to either, or both, bedrock or fine-grained alluvial confinement. When viewed within the context of past glacial/interglacial Quaternary oscillations, the record confirms a progressively drying continent based on the caliber of bedload material and lateral channel extent.