Environmental drivers of planform change in the glacially-fed Rio Chubut, Argentina (42°S)

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The eastern margin of the former Patagonian Ice Sheet was drained by large and dynamic river systems, which remain largely unstudied. New geomorphological mapping and luminescence chronology of the glacially-fed Rio Chubut reveal the preservation of large gravel outwash terraces up to 50 m above the modern river channel that previously acted as glacial spillways during the last glaciation. Also discovered is a gradual shift from a braided to a meandering planform between 12.3 ± 1.0 ka and 9.4 ± 0.8 ka, where the braided system experienced a decrease in energy and subsequent abandonment, transitioning into the meandering system that persists today. The coincidence of a new luminescence age from the innermost ice lobe in the Epuyen area (18.1 ± 2.2 ka), palaeoenvironmental records (Moreno et al. 2018, Whitlock et al. 2007, Iglesias et al. 2016) and the PATICE ice sheet reconstruction (Davies et al., 2020) suggest that the abandonment of the Rio Chubut braided planform was not a product of the river decoupling from the ice sheet. Alternatively, it was a response to the reduced water supply likely linked with the weakening and southward shift in the mid-latitude storm tracks and westerlies ~11.3 ka (Moreno et al. 2018). These findings contradict the widely reported process of planform change in glacially-fed river systems whereby a river decoupled from a glacier experiences a loss in sediment supply, which leads to incision and the river confining to a single channel. Here at the Rio Chubut, braiding is sustained in a paraglacial landscape for ~5 ka after the ice had retreated into the Andean mountains. A reduction in water supply related to precipitation changes in the early Holocene is identified as the key driver of planform change.

References


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