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SELF-ORGANIZING AVULSIONS IN AN ENDORHEIC DRYLAND RIVER SYSTEM

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Absolute age dating with Optically Stimulated Luminescence (OSL) measurements, in combination with Google Earth Pro imagery and differential GPS (dGPS) measurements was employed to unravel the processes and timing of river avulsions and the resultant sedimentary architecture of a network of Holocene Río Colorado (Altiplano Basin, Bolivia) channel belts.
A radial pattern of channel belts originated from compensational stacking of interconnected alluvial ridges. Channel-belt switching occurred by avulsions with frequencies ranging from 160 yr to 1130 yr. Rivers started with a low-sinuous (SI 1.29 to 1.64) single-channel trajectory bordered by small point bars. Over time, the rivers evolved to high-sinuous (SI 1.80 to 2.29) streams with wide point bars with a large surface area. The average lateral point-bar accretion rate is 0.5 my^{-1}.
The alluvial ridges formed by river sediment accumulation through aggradation and lateral accretion of sand in point bars, channel-floors, and levees, and by lateral amalgamation and stacking of crevasse splays. The width of the individual ridges in the study area is approximately 1.5 km. Confined inter-channel areas received crevasse splay sediment from both sides of successive channel-belt positions, and the overlapping crevasse-splay sand resulted in a higher inter-ridge elevation as compared to the unconfined side where the alluvial ridge bordered the open floodplain. Alluvial-ridge aggradation resulted in decrease of the along-river gradient and increase of cross-floodplain gradient, to the point where the channel-floor elevation became higher than the surrounding floodplain surface, whereupon avulsion occurred, and the process of alluvial-ridge growth started anew. Successive channel belts avoided the positive morphology of earlier-deposited alluvial ridges and thus formed a self-organizing, laterally-connected alluvial-ridge network over an area of 500 km^2.

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