Holocene Lower Mississippi River Avulsions: Autogenic Versus Allogenic Forcing

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Optically stimulated luminescence (OSL) dates coupled with paleohydrological estimations conducted on lower Mississippi River (LMR) meander belts provide new insight into the Holocene avulsion history of the LMR. At least four avulsions of the LMR occurred within the Yazoo Basin, MS and lower St. Francis Basin, AR between ca. 9.19 ka to the present, which are inferred to have initiated at: (i) ~ ca. 8.6 ka, (ii) ~ ca. 7.6 ka, (iii) ~ ca. 5.0 ka, and (iv) after ~ ca. 4.21 ka. These avulsions created four distinct abandoned meander belts presently preserved within the Yazoo Basin (referred to as Stage 4 - Stage 1 LMR meander belts). The avulsion nodes (point of channel bifurcation) are all located between ~ 200 to 400 kilometers north of Baton Rouge, LA. Therefore, these avulsions are spatially far removed from the immediate effects of rapid rates of sea-level rise occurring from ~ 9.19 to 5.0 ka. Two of the four avulsions were initiated after the rate of sea-level rise began slowing at ~ ca. 5.0 ka, thus suggesting these avulsions are unlikely to be primarily driven by sea-level rise forcing vertical aggradation of alluvial ridges via channel backfilling beyond suggested geomorphic threshold values. Climatic evidence supported by paleohydrological estimations suggests that all four identified avulsions initiated during inferred periods of increased precipitation throughout the lower Mississippi river drainage basin causing more frequent overbank flooding events. Thus, allogenic controls on sediment supply and discharge play a more important role in driving avulsions of the LMR then initially theorized during the Holocene.