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Tidal modulated flow and sediment flux through Wax Lake Delta distributary channels: Implications for delta development

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Abstract In this study, a Delft3D model of the Wax Lake Delta was developed to simulate flow and sediment flux through delta distributary channels. The model was calibrated for tidal constituents as well as velocity and sediment concentration across channel transects. The calibrated model was then used to simulate full spring–neap tidal cycles under constant low flow upstream boundary conditions, with grain size variation in suspended load represented using two sediment fractions. Flow and sediment flux results through distributary channel cross-sections were examined for spatial and temporal variability with the goal of characterizing the role of tides in sediment reworking and delta development. The Wax Lake Delta has prograded through channel extension, river mouth bar deposition, and channel bifurcation. Here we show that tidal modulation of currents influences suspended sand transport, and spatial acceleration through distributary channels at low tides is sufficient to suspend sand in distal reaches during lower flows. The basinward-increasing transport capacity in distributary channels indicates that erosive channel extension could be an important process, even during non-flood events.

Key words Wax Lake Delta; tidal-modulation; delta distributary channels; erosion