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Channel Structure at the Fluvial-tidal Transition

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This study was conducted to shed light on the fluvial-tidal transition zone channel features of a coastal plain river. This study was conducted along the Santee River as it crosses the South Carolina coastal plain, USA, ∼60km from the mouth. The selected river reach experiences tidal oscillation in stage and velocity, and intermittent current reversals. The channel bed consists of a 2.5m dome-shaped bedrock high, and this feature has a marked effect on channel width and width:depth ratios, but a negligible effect on cross section area of flow. Hence, upstream channel convergence continues across the bedrock high. The limit of convergence and the limit of current reversals, as well as the transition from predominantly bedrock to alluvium channel all occur over a distance of 2-3km. These observations lead us to propose a conceptual model for coastal plain rivers to guide continued study on modern fluvial-tidal systems. The transition zone should be divided into four sections characterized by the position of three critical hydro-geomorphic features: 1) the upstream limit of tidal oscillations, 2) the upstream limit of current reversals and 3) the upstream limit of zero salinity. The location and relative position of these features depends on the magnitude of hydrologic and marine forcings for shorter time scales, and rate of sea level rise over longer time scales. However, the along channel position of an abrupt decrease in cross section area of flow, or upstream convergence, in this modern river appears to be adjusted to the lower, more frequently occurring discharges.