TRACKING BARRIER ISLAND RESPONSE TO EARLY HOLOCENE SEA LEVEL RISE: HIGH RESOLUTION STUDY OF ESTUARINE SEDIMENTS IN THE TRINITY RIVER PALEOVALLEY

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ABSTRACT

Understanding how paleoshorelines responded to factors such as variations in sediment supply, relative sea-level rise (RSR), and accommodation is a valuable analog for preparing coastal communities for future impacts of climate change. Here we examine the stratigraphic framework of the Trinity River paleovalley, offshore Galveston, Texas. The youngest paleovalley was incised during the last low-stand and infilled during the Holocene as rising sea levels flooded the valley, forming a series of discontinuous, landward-stepping barrier island systems. We present high-resolution imaging of the Trinity incised valley fill using over 1200 km^2 of 3D seismic, <700 km of 2D full waveform chirp data, along with 9 cores, 5 platform borings, with associated grain size, foraminiferal, and Carbon-14 data. The preserved stratigraphy show the transition from older Pleistocene fluvial to younger Holocene estuarine conditions, with over half of the overall valley fill comprised of the latter. The ground-truthed chirp data reveal that the estuarine section records a gradually landward migrating barrier system, where distal estuarine deposits are overlain by proximal estuarine sediments within the incised valley fill. Previous authors have focused on discrete flooding events associated with episodic, rapid RSLR that drive abrupt, landward jumps in the barrier island system. Our work challenges this model, as seismic stratigraphic, foraminiferal, and carbon-14 data suggest that the paleoestuary within our study area was influenced by a more gradual landward migration of the barrier system, and that factors other than RSLR alone may have been key to barrier island stability.

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