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WHAT, NO GULL-WINGS? MULTIPLE SCALES OF LEVEE FAILURE IN OUTCROP AND SEISMIC

Levee geometries are typically considered to consist of a fairly regular, gull-wing shape in cross-section. Although mass failures on both the inside (channel axis) and outside of levee slopes have been reported in the literature, the reported failures have not been of a large enough scale to affect the geometry of the levee deposits as a whole. Our investigations of the Upper Cretaceous Rosario Formation indicate that levees can consist almost exclusively of these mass failure deposits, preserving almost no indication of the classic wedge or gull-wing shaped levee. These levee deposits consist primarily of thinly (2-100 cm) interbedded siltstone and sandstone beds. Mass failure includes dewatering structures and convolute laminations within beds; beds slumped externally on a small (few cm) to very large (several meters thick) scale; pebbly mudstones up to ten meters thick; and coherent blocks rotated and/or slid on a large (few m thick) to very large (over 100 m thick) scale. In addition to the outcrop evidence, seismic data from the northern Gulf of Mexico shows a channel-levee complex that exhibits very large-scale failed levees, with rotated blocks on both the inside and outside of the levees (rotated toward and away from the channel axis) of up to 250 m thick and a disrupted zone 8 km wide (the complex is 30 km wide). Although the classic gull-wing geometry of the levees is preserved on one side of the channel, where these mass-failures occur the geometry is completely disrupted and replaced by a jumble of blocks.