When Does Spatial Variation in Subsidence Rate Influence the Positioning of Channels Within Quaternary Strata of Mississippi River Delta?

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We present data from an industry-grade seismic volume located over more than 800 square km of Breton Sound, LA that images the Quaternary stratigraphy of Mississippi River delta. In this study area we have mapped more than 70 channel bodies for distances up to 15 km in the streamwise direction. These channel bodies range in width from 100 to 1000 m and have width/depth ratios between 10 and 30. Most of these channel bodies traverse active growth faults and in doing so were subject to measurable, local variations in subsidence rate. We will summarize the affect of spatial variation in basin subsidence on the positioning of river channels and their deposits. Patterns of local and regional subsidence have been determined by mapping regional seismic horizons throughout the data volume. Velocity surveys and paleontological data from a handful of petroleum wells have been used to convert the observed subsidence patterns into maps defining long-term subsidence rates. Local, long-term displacement rates associated with growth faults are 4 - 8 % greater than the regional, long-term subsidence rate. This difference is not sufficient to redirect or change the form of greater than 90 % of the studied channel bodies. We will examine this insensitivity by comparing channel depth to the potential surface relief generated by the spatially varying subsidence rates. Interestingly, a small percentage of channels are affected by the active faults. We propose that this interaction is a consequence of the recognized punctuated character of fault displacements in greater Breton Sound at the shortest time scales. These rapid displacements can be sufficient to redirect channels. We will discuss the roles that short-term versus long-term variations in subsidence pattern have on the generation of channelized fluvial stratigraphy.