Fault Induced Subsidence in Southeastern Louisiana? A Comprehensive Evaluation of the Magnolia Growth Fault, Plaquemines Parish, Louisiana

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ABSTRACT

As oil and gas industry seismic data becomes available for university research, evidence indicating fault-induced subsidence in southern Louisiana becomes more apparent. A geologic investigation of the Lake Hermitage area west of the Mississippi River in Plaquemines Parish, Louisiana, suggests an active, regional growth fault has caused rapid local subsidence. The Magnolia growth fault is a down-to-the-south, deep-seated listric fault bounded by two salt diapirs. Growth faults in southern Louisiana are a fundamental structural element of the northern Gulf of Mexico Salt Basin and deep subsurface data shows that they have been locally active through much of the Cenozoic. Previous research has suggested that areas of hotspot subsidence correlate to the known location of faults such as the Lake Hermitage area where the Magnolia growth fault has been mapped. Evidence from 3D seismic data, well logs, biostratigraphy, and local geomorphology suggests the fault has been active since the Miocene and is causing submergence of wetlands on the hanging wall side. Like many regional growth faults in southern Louisiana the Magnolia growth fault's projected surface trace is indicated by an abrupt, linear boundary between emergent wetlands and open water. Wetlands overlying the footwall have been stable in recent decades whereas wetlands overlying the hanging wall have experienced rapid subsidence and a change from land to open water. Stratigraphic relationships in the 3D seismic survey and well logs clearly indicate an increase in fault throw with depth and an expansion of stratigraphic intervals from the footwall to the hanging wall. Shallow vibracores (~30 ft) are currently being analyzed to determine near-surface offset of the fault and to assess Holocene fault motion and rates of fault slip using radiocarbon dating at key stratigraphic intervals. A complete understanding of

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fault-induced subsidence in southern Louisiana is necessary to maximize the benefits of coastal management.