




# Integrated Near-Surface Geophysical Studies over Two Growth Faults (Willow Creek and Hockley Faults) in the NW Houston Area, Texas

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## ABSTRACT

Ongoing sediment deposition and related deformation in the Gulf of Mexico cause faulting in coastal areas. These faults are aseismic and underlie much of the Gulf Coast area including the city of Houston in Harris County, Texas. Considering that the average movement of these faults is approximately 3 inches per decade in Harris County, there is a great potential for structural damage to highways, utility infrastructure, and buildings that cross these features. Using integrated geophysical data (GPR, resistivity, magnetics, and conductivity), we have investigated the Willow Creek (WC) and Hockley faults. Results indicate significant geophysical anomalies within the known WC and Hockley fault zones. Resistivity data appear to image the downthrown side of the fault as possessing less resistive materials than the up-thrown side. A gravity high observed on the downthrown side of the both faults, which is probably caused by the compaction of the unconsolidated sediments in the downthrown side (dewatering). The GPR data indicated an anomaly in the vicinity of the WC Fault. GPR results over the Hockley fault indicate multiple micro-fault anomalies (displacements) in the near-surface. Both magnetic and conductivity data indicate anomalous values across the fault zone. Modeling of WC magnetic data suggests a vertical throw on the fault. However the Hockley Fault indicates a narrow zone of negative magnetic anomaly. The source of this magnetization could be due to the alteration of mineralogies by the introduction of fluids into the fault zone. The nonunique model of the gravity and magnetic data indicates strong correlation of a lateral change in density and magnetic properties across the Hockley Fault. In conclusion, these studies indicate that the detection and characterization of these faults are possible, and results improve our understanding of growth-fault structure. Thus, the better understanding the subsurface geology yields better mitigation of these hazardous faults.

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## NOTES