

Growth Faults and Relay Ramps: A High-Resolution Seismic Survey, Livingston Parish, Louisiana

Elliott, Erin ¹; Lorenzo, Juan ¹ (1) Department of Geology and Geophysics, Louisiana State University, Baton Rouge, LA.

The southern coast of the United States, bordering the Gulf of Mexico, is home to several down-to-the-south, listric, normal fault systems. In aerial view, these faults strike parallel to the coast. One of these, the Baton Rouge-Tepetate Fault System, southern Louisiana, consists of a series of near-surface, reactivated growth faults and soft-linked relay ramps-- a broad area of ductile strain, with contemporaneous sedimentation. Evidence of recent fault and relay ramp movement can be seen in surficial fault line scarps, offset roads, and the distribution of sediment throughout the area. In order to study this soft-sediment system, two near-surface (0 - 300 m), high-resolution (10 - 300 Hz), 300 m-long, continuous seismic reflection profiles (3 m, geophone spacing; 24-channel) were collected across a growth fault and a portion of a relay ramp in Livingston Parish, Louisiana. The seismic source was a Down-hole Betsy Seisgun with 200 grains FFFF Black Powder and source-to-receiver offsets ranging from 4 to 73 meters. One seismic line crosses near the tip of the growth fault at a point where there is no noticeable vertical offset. The second seismic line crosses the fault where a surficial scarp shows an offset of a few meters. These two, near-surface seismic profiles are processed and then analyzed for broken, offset reflectors indicating fault movement. This analysis, combined with data from well logs and gravity surveys across the fault and in the ramp area, investigates the link between (1) observed width and distribution of strain within the expected broad, fault deformation relay ramp zone, and (2) sediment density distributions previously inferred from gravity studies. This study will provide new insights into soft sediment fault linkage.