Southeastern Section - 68th Annual Meeting - 2019

Paper No. 37-10
Presentation Time: 1:00 PM-5:00 PM

INTEGRATED SEISMIC-REFLECTION AND MICROGRAVITY IMAGING ACROSS THE SOUTHERN BOUNDARY OF THE CHARLESTON UPLIFT, NEW MADRID SEISMIC ZONE, USA

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A stratigraphic uplift, called the Charleston uplift (CU), is a 30-km-long by 7-km-wide, N46°E-oriented subsurface geologic anomaly located in the northern Mississippi embayment near Charleston, Missouri. Originally identified by correlative mapping of the upper 100 meters of sediments using more than 500 shallow boreholes, the uplift exhibits up to 36 m of relief across the Paleogene and Quaternary. The vertical relief, together with the CU's coincident boundary alignment with contemporary microseismicity, as well as its along-strike projection from the New Madrid north fault suggests it is structurally controlled; however, an erosional origin associated with remnant Pleistocene paleofluvial channels has not been ruled out. Subsequent seismic soundings across the CU's northern boundary indicate the vertical offset also affects the tops of the deeper Cretaceous and Paleozoic horizons, supporting the fault-controlled origin of the uplift; however, the southern boundary had not been investigated, nor had a direct fault image been acquired at either boundary. We use integrated microgravity and seismic-reflection methods across the inferred southern boundary to establish the first image of the hypothesized southern fault of the CU. Vertical relief determined from prior seismic soundings across the CU's northern boundary leads to a modeled gravity anomaly of 1.55 mGal. The observed gravity anomaly from a microgravity survey across the southern boundary is 1.616±.004 mGal, and thus is consistent with the fault interpretation. A seismic-reflection profile acquired coincident with the microgravity survey also corroborates the fault interpretation. The seismic-reflection imaged deformation shows approximately 67, 36 and 30 meters of vertical down-to-the-south throw across the tops of the Paleozoic, Cretaceous and Tertiary horizons, respectively. This evidence confirms the CU is not an erosional artifact, but a structurally controlled extension of the New Madrid north fault.

Session No. 37--Booth# 10

T5. A Window into Regional Deformation and Sedimentation through Geo-, Thermo-, and Petrochronology (Posters)
Friday, 29 March 2019: 1:00 PM-5:00 PM

Carolina Ballroom (Francis Marion Hotel)

Geological Society of America *Abstracts with Programs.* Vol. 51, No. 3
doi: 10.1130/abs/2019SE-327126

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