Shallow Seismic Reflection Investigation of the Big Ridge Escarpment, Jackson County, Mississippi

Jared S. Bullock, James B. Harris, and Brooks A. Rosandich

Millsaps College, 1701 N. State St., Jackson, Mississippi 39210

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ABSTRACT

The Big Ridge Escarpment (BRE) is a 20-km-long, east-west oriented, linear topographic feature on the Mississippi Gulf Coast. The change in elevation (down-to-the-south) across the BRE ranges from approximately 4.5 to 6.0 m. Two theories have attempted to explain the origin of the escarpment. The first theory suggests that it was caused by wave erosion. The second theory maintains that the BRE formed as a result of normal faulting. This origin is supported by the escarpment's linear trend and abrupt elevation change. Active growth faults (east-west oriented and down-to-the-south) have been imaged by seismic methods at sites to the west of the BRE—in the Lower Pearl River Valley, and in the Baton Rouge area. We collected a ~215-m-long shear-wave (S–wave) seismic reflection profile (north-south oriented) across the BRE (along McCann Road in St. Martin, Mississippi) using a 24-channel landstreamer acquisition system and a 1.8-kg sledgehammer seismic source to provide a high-resolution image of the near-surface structure. The processed reflection profile exhibits strong reflection energy to depths of greater than 85 m. Abrupt changes in reflection amplitude and coherency, and offsets in reflections, suggest the presence of two high-angle down-to-the-south faults. Back-tilted (northward dipping) shallow reflections, a possible rollover feature in the hanging-wall block of the northern fault, and apparent thickening of reflections on the downthrown side of the southernmost fault are also consistent with the near-surface structure of growth faults.

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