Near-Surface Geophysical Imaging of Deformation Associated with the Daytona Beach Sand Blow Deposits, Lee County, Arkansas

Michael Rohrer[1], James Harris[1], Cooper Cearley[1], and Mark Teague[2]

[1]Millsaps College

[2]TeaCo Geophysical

ABSTRACT

Within the past decade or so, paleoseismologic and geophysical studies at the Daytona Beach (DB) site in east-central Arkansas have reported earthquake-induced liquefaction (sand blows) along a prominent NW–trending lineament dated to approximately 5.5 ka. A recent compressional-wave (P–wave) seismic reflection survey acquired by the U. S. Geological Survey (USGS) along Highway 243 in Lee County, Arkansas, across the DB sand blow cluster, identified a previously unknown fault zone that is likely associated with the liquefaction. However, the USGS data were not able to image the Quaternary section (<60 m deep) and show a direct connection between the deeper faulting and the sand blows. In order to investigate the near-surface structure of the fault zone, we acquired an integrated geophysical dataset consisting of 430-m-long shear-wave (S–wave) seismic reflection and ground penetrating radar (GPR) profiles above the deformation imaged on the USGS profile. The S-wave reflection data were collected using a 24-channel, towable landstreamer and the seismic energy was generated by a sledgehammer/I-beam source. The GPR data were collected with a cart-mounted 250–MHz system, using a 0.5–m antenna spacing and a 0.10–m step size. Changes in reflection amplitude and coherency, offset reflections, and abundant diffractions suggest the presence of a complex zone of high-angle faults in the shallow subsurface coincident with the mapped lineament. Folded shallow reflections show that the deformation extends upward to within 10 m of the surface. Furthermore, the GPR profile images a distinct zone of deformation in the very near surface (< 1.5 m deep) that is coincident with the upward projection of the deformation imaged on the S-wave seismic reflection profile.

M. Rohrer, J. Harris, C. Cearley, and M. Teague, 2019, Near-surface geophysical imaging of deformation associated with the Daytona Beach sand blow deposits, Lee County, Arkansas: GeoGulf Transactions, v. 69, p. 599.

NOTES