**Lorenzo**, J. M. Hicks, J. Vera, E. 2011 Shallow (0-10 m) seismic investigation of a distressed earthen levee, New Orleans, USA.SAGEEP 2011 Charleston, SC. S21: Earthen Dams and Levees: Geophysical Reconnaissance, Exploration, and Monitoring Wednesday, April 13 Room 3, 273-S21

Both deep- and near-surface hydrogeologic processes can contribute to the structural failure of artificial earthen levees. Recently, seismic geophysical methods have attempted to develop a proxy for engineering shear strength, by mapping changes in the transmission velocity of shear waves. High fluid content may indicate both weak, under-compacted materials and/or organic-rich sediments. In the absence of electromagnetic methods, Vp/Vs ratios can be used as good indicators of variations in the fluid (water, and air or gas) saturation. Cone penetration borehole tests measure the resistance of soils to penetration of the cone tip and its frictional sliding that can be correlated to sediment types and their physical properties. A distressed section of an artificial earthen levee, suitable for seismic investigation, lies ~15 km S of the city of New Orleans, Louisiana, USA. Open curvilinear fissures, 10 cm wide, 30 cm deep, and up to 100 m in length, exist along the crest at two sites. Between September 2007 and February 2008 we collect horizontally (SH) polarized shear and compressional wave (P) data in pseudo-walkaway tests for the upper 100 m of the subsurface along the protected (west) side of the earthen levee, within 30 m of its crest. One profile lies parallel and adjacent to the damaged levee crest and, for reference, two profiles lie nearby adjacent to undamaged portions of the artificial earthen levee. In the first ~30 m of sediment below the lower delta plain of the Greater New Orleans area, a complex and dynamic interaction of freshwater and marine sedimentary environments juxtaposes a diverse set of facies. We combine of Vp and Vs velocity maps, sedimentary environment interpretations, and cone-penetration-derived sediment/soil and laboratory-derived physical properties to locate possible zones of high fluid concentration, (and perhaps seepage), weak engineering materials, and natural foundation soil shear strength. Under the distressed portion of the earthen levee, shear modulus minima in a constructed profile, correlate with zones of estimated high saturation porosity (80%) high organic content and undercomapcted clay-rich sediments. We interpret that despite nominal full soil saturation, small in-situ intergranular, free gas maintains Vp values low (~140 m/s). However, Vp/Vs ratios increase to values > 14 within gas-free sands of the underlying St. Bernard delta lobe complex (2000 –4000 yr) at shallow depths (~ 5m).