

DEVELOPMENT OF SHEAR WAVE VELOCITY PROFILES IN THE DEEP  
SEDIMENTS OF THE MISSISSIPPI EMBAYMENT USING SURFACE WAVE AND  
SPECTRAL RATIO METHODS

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**ABSTRACT**

The deep soils of the Mississippi Embayment in the central United States will have a significant influence on earthquake ground motions generated by the New Madrid Seismic Zone. The seismic properties of these soils, which extend to depths of over 1000 meters in some areas, are poorly characterized at depths below 60 to 100 meters. This study presents shear wave velocity ( $V_s$ ) profiles determined from Spectral-Analysis-of-Surface-Waves (SASW) measurements performed at eleven sites in Arkansas, Tennessee, and Missouri. These measurements were performed using the low-frequency field vibrator developed as part of the NSF Network for Earthquake Engineering Simulation (NEES) program. Shear wave velocity profiles were developed to depths of approximately 220 meters at eleven sites located throughout the Mississippi Embayment. In addition to the SASW measurements, ambient noise measurements of horizontal and vertical ground motions were performed to estimate the average  $V_s$  over the full profile depth using the H/V spectral ratio method. The  $V_s$  profiles derived from the SASW measurements compared well with  $V_s$  reference profiles that have been developed for the Mississippi Embayment and used in recent site response studies of the region. The observed variability of the profiles was found to be in general agreement with past assumptions used for the deep soil and correlated with changes in soil lithology. Relationships between the soil formations and  $V_s$  were consistent with past studies and provided information to greater depths. Lastly the H/V spectral ratio measurements were successfully applied at each of the eleven sites, but appeared to overestimate the average  $V_s$ .