Public Abstract

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Title:STUDY OF SURFACE WAVE METHODS FOR DEEP SHEAR WAVE VELOCITY PROFILING APPLIED IN THE UPPER MISSISSIPPI EMBAYMENT

The primary objectives of this study are to (1) compare active-source and passive (ambient vibration) surface wave methods for developing Vs profiles to depths of 200 to 300 m at deep soil sites, and (2) identify the primary factors affecting the reliability and consistency of surface wave methods. This comparative study became possible with the advent of a unique low-frequency field vibrator developed as part of the National Science Foundation (NSF) Network for Earthquake Engineering Simulation (NEES) program. This vibrator is able to actively excite surface wave energy down to frequencies of less than 1 Hz. Four surface wave methods (two active-source methods and two passive-source methods) were applied in this study, namely: (1) the Spectral-Analysis-of-Surface-Waves (SASW) method, (2) the active-source frequency-wavenumber (f-k) method, (3) the passive-source frequency-wavenumber (f-k) method and (4) the refraction microtremor (ReMi) method. Measurements were performed at eleven sites distributed over a distance of about 180 km in the upper Mississippi Embayment in the central United States, where soil deposits are hundreds of meters deep.

The focus of this study is on two critical aspects of surface wave methods: (1) development of a reliable surface wave dispersion curve from field measurements, and (2) compatibility between the experimental dispersion curve and the theoretical model used in the inversion procedure to develop the final Vs profile. Limitations associated with each of the four methods were identified, and model incompatibility of the fundamental-mode inversion was observed in this study. Base on the findings from this study, recommendations for procedures to perform deep Vs profiling using surface waves are presented.