Public Abstract
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Title:Analytical Study of the Spectral-Analysis-Of-Surface-Waves Method at Complex Geotechnical Sites

The Spectral-Analysis-of-Surface-Waves (SASW) method is an accepted means of measuring shear wave velocity (VS) profiles that has been used successfully for a variety of engineering applications. However, experience in the field has shown that in some settings, SASW measurements have produced results that were inconsistent with the results from other methods of measurement. In this study the effectiveness of the SASW surface wave methodology at complex geotechnical sites was investigated to identify site conditions where the SASW approach may produce erroneous results. This was accomplished by performing analytical simulations of surface wave measurements for a variety of realistic geotechnical conditions involving large and abrupt changes in VS. The simulated surface wave measurements were processed using both the traditional SASW methodology (termed a global analysis), and a more rigorous approach (termed an array analysis) to generate experimental dispersion curves for the site. The effectiveness of these approaches was evaluated by comparing the experimental results to the true dispersion curve for the site. It was found that the traditional global analysis approach yielded dispersion curves that tend to underestimate surface wave velocities at long wavelengths for nearly all of the profiles tested. The array approach worked well for both simple, gradually increasing VS profiles as well as for many of the more complex profiles with large VS contrasts. However, for some of the profiles tested, both the global and array analysis produce an experimental dispersion curve that is not consistent with the theoretical dispersion curve for the site. Most notably, this problem was observed for the case of soft-over-stiff profiles, a common profile encountered in the field. The VS profiles determined under these conditions are greatly in error from the true VS profiles for the site. These results may implications for site-specific earthquake site response analysis as well as the determination of site classification for code-based earthquake design.