

Estimation of 2D shear wave velocity profile of soil layers using surface wave seismic tests

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The 2D shear wave velocity profile of strata is estimated using the active and passive surface wave seismic tests. The experimental dispersion curves were obtained after the recorded signals were transformed by the slant stack procedure. The phase velocity in the relatively high frequency range can be obtained using the dispersion curves deduced from the active tests. On the other side, dispersion curves obtained from the passive tests can be used to estimate the phase velocity in the relatively low frequency range. From the higher frequency portion of the dispersion curves that stand for the fundamental mode, we obtained the phase velocities about 190 m/s for the sandy surface fill. Theoretical dispersion curves can be constructed by the thin-layer-stiffness-matrix method. For theoretical dispersion curves, the soil layers of the test site were modeled as the sandy surface fill overlying a half space soil layer. A real-parameter genetic algorithm was programmed to minimize the difference between the theoretical and experimental dispersion curves. We prove that the real-parameter genetic algorithm is capable to reduce the error between experimental and theoretical dispersion curves. The estimated 2D geometry of the sandy surface fill using the active and passive surface wave seismic tests was verified with the borehole data.

Keywords: Slant stack, shear wave velocity, genetic algorithm, dispersion curve