

# Surface seismic survey using horizontal ground vibrations for monitoring shallow ground conditions

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Surface seismic survey is frequently used to survey shallow ground structures. The method of surface seismic survey mainly observes and analyzes propagation of Rayleigh wave. Recently, the technology of distributed acoustic sensing (DAS) using a fiber optical cable has been developed. The DAS technology use optical fiber cable with reasonable price for transducer device and can measure records of ground vibration in a long section so that it is considered to have high potential to use for monitoring ground conditions. When the DAS technology will be used to survey shallow ground, it becomes important to observe and analyze records of surface wave. The DAS technology has high sensitivity of the expanding direction of an optical fiber, which is different from the measuring condition using standard vertical vibration. Thus, we evaluate surface survey using horizontal vibration along a survey direction. 10 Hz geophones of three components was used for our study. Amplitude of a horizontal component is lower than the amplitude of a vertical component in the source condition of a vertical shot, but we could acquire dispersion curves from horizontal vibrations along a survey line similar to that from vertical vibration. Surface seismic survey is considered to be able to be applied using the DAS technology. Optimum depths set for optical fibers and difference between a vertical component and horizontal components are also discussed.

Keywords: surface seismic survey, horizontal component, distributed acoustic sensing