



Multi-channel analysis of Rayleigh waves based on Vector Wavenumber Transformation Method(VWTM)

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In the last two decades, surface-wave inversion methods such as multi-channel analysis of surface waves (MASW) have increasingly been used in engineering prospecting because of its convenience and high-efficiency. In this paper, a new multi-channel surface wave analysis method based on a Vector Wavenumber Transformation Method (VWTM) is proposed. By approximating the source, we obtain the empirical Green's function between station and the source based on the horizontal layered model, and then perform vector wavenumber transformation to obtain a frequency-phase velocity dispersion energy image for the Rayleigh wave. We first evaluate the performance of VWTM by applying it to the synthetic data, and by comparing to the theoretical dispersion curves. Comparing with typical MASW method such as the phase shift method, we find that VWTM has higher resolution and imaging quality for fundamental and higher modes in the dispersion energy image. Next, we apply the VWTM to the multi-channel transient surface wave exploration. Through comparative analysis with the phase shift method, we find that VWTM is convenient, practical and effective to extract multi-mode Rayleigh wave dispersion curves, and provide a useful alternative for the inversion of Rayleigh wave dispersion fundamental and higher-mode curves.