Numerical analysis on the application of HWAW method on thin surface layer condition assessment: a Preliminary study

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ABSTRACT

Spectral analysis is a non-destructive testing method using the dispersion characteristics of surface waves, developed for ground exploration and applied to evaluate the depth of cracks in road structures. Harmonic Wavelet Analysis of Waves (HWAW) was suggested as an analysis method utilizing the wave behavior from the near-field effect, one of the major sources of error in SASW analysis. HWAW method considers the body wave interference by performing harmonic wavelet transformation based on the maximum energy point in the time-frequency domain, which has the advantage of reducing the error by ambient noise on site. The condition evaluation of actively used infrastructures such as railways and roadways by the HWAW method is expected to have enhanced accuracy. Further study is necessary to optimize the experiment method considering the thin layered structure of such conditions.

This study is a preliminary research on the application of the HWAW method to assess the degradation state of thin-layered structures. Numerical case studies are conducted on the contact state between the layers and the distribution of properties of the lower layer. Surface wave behavior and the resulting dispersion curve characteristics for degradation cases are examined. Through this research, the methodology for assessing the condition of thin-layered structures are expected to advance.

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