



Multimodal Surface Wave Inversion in the Hidden Danger Detection of Small-scale Dam

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The small-scale dam is mostly composed by the wall with a clay core and thin surface layer, which makes the anti-seepage body will easily generates many kinds of hidden dangers including inhomogeneity, poor compactness and leakage. In order to ensure the safe operation of dam, a convenient and economical nondestructive technique should be considered in the routine maintenance. Surface wave method, as a high vertical resolution geophysical method, is usually used in the hidden danger detection of dam. In the safety assessment of dam, the processing way of surface wave method commonly used the multichannel analysis of surface waves (MASW) method combined with a fundamental inversion procedure. However, due to the site limitation of small-scale dam, such a traditional way cannot give a suitable horizontal resolution and investigation depth simultaneously. Numerical studies have shown that multimodal surface wave inversion can obtain a greater exploration depth and better resolution. In our study, we used a relative short array with a large offset to collect the multimodal surface wave data, and used the multimodal surface wave inversion to investigate deeper area. As a result, we obtained a 2D shear wave velocity profile that holds a considerable horizontal resolution and exploration depth. In addition, a high resolution linear radon transform was used in dispersion imaging to guarantee the quality of multimodal data. A real data of the small-scale dam was tested and shows that it is possible to locate the hidden danger area well and the range can be imaged clearly, some anomalies in the 2D shear wave velocity profile are in good agreement with the results provided by electrical method. It therefore provides a convenient and reliable approach for the hidden danger detection of small-scale dam.