Detection of water leaks from subsurface structure using ground penetrating radar: Experiments at an artificial sandy ground

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Abstract: The main purpose of this paper is to evaluate the applicability of the wide-angle GPR survey to the detection of the water leakage around the underground buildings.

GPR survey is one of the most promising survey methods within a numbers of monitoring techniques for underground structures because of its high resolution and non-destructive characteristics. Among the GPR measuring method, wide-angle survey obtains high-quality results because coherent noise such as direct arrivals, multiples, or time synchronous system artifacts are effectively eliminated by CMP stacking. Moreover, wide-angle method can derive subsurface permittivity distribution which can be the index of water contents.

In the present paper, we tested wide-angle GPR surveys for imaging the various conditions of controlled subsurface water distribution in a test field composed by an artificial sandy ground and a mortar wall. As the results of wide-angle GPR surveys, the following conclusions were derived.

1. The water table can clearly be imaged as a flat and continuous reflector when the water level was 1.4-1.7m below the ground surface.
2. The 10 cm rise of the water table which due to water leak from the mortar wall can be delineated in the GPR section.

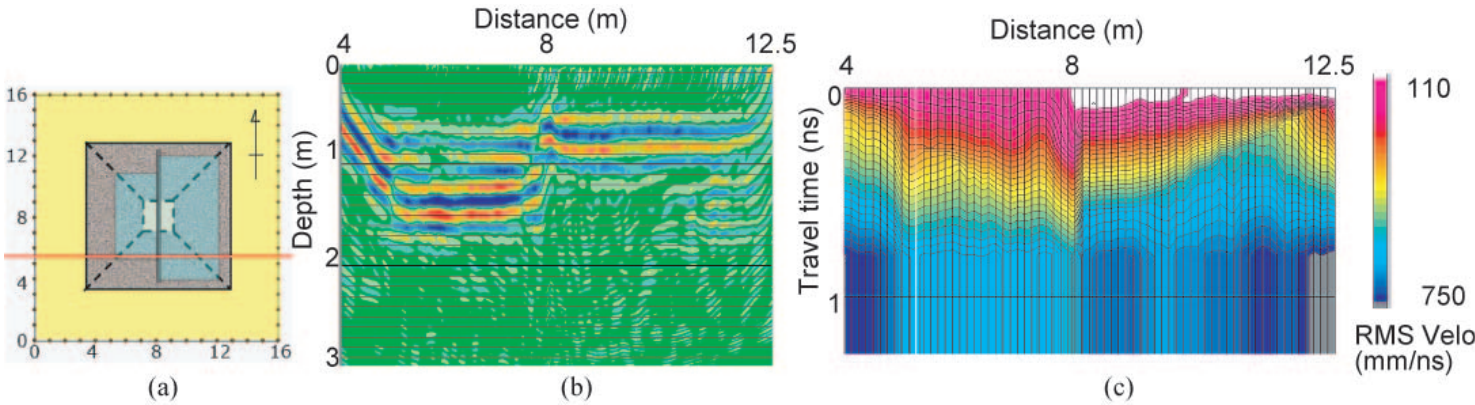

Fig. 1. Results of data processing along the survey line LY6.15.
(a) A plan view of the test field indicating the GPR survey line.
(b) A depth section of wide angle GPR processing result.
(c) RMS migration velocity distribution obtained by prestack migration velocity analysis iteration.