Geophysical Research Abstracts
Vol. 19, EGU2017-4314, 2017
EGU General Assembly 2017

GPR Experiments of the Simulated Cavity Detection in Urban Areas

Changryol Kim, Woong Kang, Jeongsul Son, and Soocheol Jeong

Korea Institute of Geoscience and Mineral Resources (KIGAM), Exploration Geophysics & Mining Engineering, Daejeon, Korea, Republic Of (ryol1102@kigam.re.kr)

Recent years, the deteriorated underground facilities such as sewage or water supply pipes have increased significantly with growing urban development in Korea. The soils surrounding old damaged pipes were washed away beneath the roadbed, causing underground cavities and eventual ground cave-ins in the urban areas. The detection of the roadbed cavities is, therefore, required to prevent property damage and loss of human lives for precautionary measures. In general, GPR is well known as a suitable geophysical technique for shallow underground cavity detection. 3-D GPR technique was applied to conduct the full-scale experiment for roadbed cavity detection. The physical experiment has employed the testing ground with soil characteristics of silty sand soils. The experimental test ground consists of physically simulated cavities with dome-shaped structure, and of hume concrete and cast-iron pipes to simulate underground facilities. The pipes were installed more than one meter below the land surface and simulated cavities nearby were also installed at regular intervals in spatial distribution. The land surface of the site was not paved with asphalt concrete at the current stage of the experiments. The GPR data was obtained to investigate GPR responses due to different antenna orientations (HH and VV antenna orientations) over the testing ground. The results of the experiment show that the reflection patterns from the simulated cavities are hyperbolic returns typical to the point source in 2-D perspective. The different antenna orientations have shown the different areal extents of the hyperbolic reflections patterns from the cavities, and have shown the different characteristics over the pipes on the data. A closer inspection of 3-D GPR volume data has yielded more clear interpretation than 2-D GPR data regarding where the cavities are situated and what kind of shape the cavities show in space. This study is an ongoing project of KIGAM at a second stage of the physical experiments, and more realistic conditions of the road surface with asphalt pavement would be prepared for the next stage of the experiments.