

Cavity mapping and grout monitoring: a microgravity case history in Korea

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Muan has suffered from subsidence, thought to be related to cavities developed in Paleozoic limestone. Microgravity survey was executed at a rice field in Muan for subsurface cavity mapping. The data were collected using a Scintrex CG-3 gravimeter at about 800 stations by 5 m interval along paddy paths, which provided a semi-grid data set.

The residual gravity anomaly was interpreted by Euler deconvolution, and 2-D and 3-D inversion. The density distribution of the profiles was drawn by two dimensional inversion based on the minimum support stabilizing functional, which generated better focused images of density discontinuities. Three-dimensional density distribution was imaged by growing body inversion. We devised an inversion scheme utilizing Euler deconvolution as a priori information in order to reduce the inherent non-uniqueness of gravity inversion. The essential point of the scheme is to restrict the model space with help of Euler deconvolution, which pointed plausible locations of anomaly sources. The three-dimensional density image showed that the cavities were dissolved, enlarged and connected into a cavity network system. It was generally coincided with the result of resistivity survey and supported by drill hole logs.

A time-lapse microgravity survey on a newly widen road passing through the site for monitoring the change of the density distribution before and after grouting. The comparison of density distributions imaged by minimum support inversion showed the change and development of density structure during the lapsed time, which implies the effects of grouting.