

Estimation of ground subsidence in urban subway construction area using PSInSAR technique: a case study in the eastern part of Seoul

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Abstract

Recently, geologic disasters such as sinkhole or subsidence in urban areas have emerged as a social issue. These geological disasters are the main cause of water pipe rupture but are the second most common in large-scale building construction areas and subway construction areas. Therefore, the study was conducted with the aim of finding out what kind of displacement occurs due to subway construction on the surface around the downtown area. As for the study area, displacement was estimated for areas where subway construction is in progress, such as eastern Seoul, Guri, and Hanam. In these areas in eastern Seoul, unconsolidated sedimentary layers and sedimentary rocks are distributed around the Han River. This is a less stable geological environment than granite or gneiss, and surface displacement can occur relatively easily. In addition, the Hanam extension subway line from eastern Seoul to Hanam has been under construction since 2014, and the Byeolnae subway line has been in progress in Guri from 2017. 100 SENTINEL-1 Ascending SAR images were used from November 2015 to August 2020, including the study area. Buildings distributed in Seoul and the metropolitan area can serve as permanent scatterers, and the displacement in mm per year can be estimated using PSInSAR technique. As a result, a local displacement of about $-0.3 \sim -1 \text{ cm/year}$ was observed near the construction area of the Hanam extension line. and the case of the Byeolnae Line construction area, no displacement beyond the error was observed. And the result was verified by comparing it with the Songpa GNSS station data. Although the restriction of displacement due to geological conditions was observed near the construction area in the downtown area, it is a qualitative result confirmed visually and additional research using other datas is needed.

Key word : SENTINEL-1, PSInSAR, subsidence, GNSS