ABSTRACT

Large number of underground cavities (natural or anthropogenic) throughout France territory could provide a risk (threat) that relates to the ground movements, when their instabilities due to natural degradation occurs. As a consequence, these ground movements could induce significant damages to the structures in their movement areas. Thus, better understanding of structural response with improved experimental method to assess the risk of damage on existing structure is needed.

The objective of this study is the analysis of structural response and the damages with Digital Image Correlation (DIC) from experiments carried out on a 1/40th scaled masonry model subject to subsidence that were performed with 3D physical model (1g) as ground movement simulator.

The results demonstrated the soil-structure interaction described with transfer ratio of settlement and structure parameters (deflection relative, average slope, and horizontal strain) which depends on the nature of the structure, its stiffness and position. Structure in hogging zone has higher transfer ratio than in sagging zone i.e. structure in extension is more vulnerable than in compression. Influence of mortar at joints between bricks is significant, mortar increases structure stiffness and reduces the damages compared to structure without mortar. Openings (windows) also increase the structure vulnerability and no significant influence of settlement time.

Keywords: 3D physical model, masonry structure, soil-structure interaction, settlement, damage assessment