# Impact of Karst Water Inrush on Urban Tunnels and Grouting Sealing Measures: A Postprint Study

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**Date:** 2025-07-29T19:11:16+00:00

## Abstract

Karst geological regions, owing to their unique geological structures and surface morphologies, frequently encounter hydrogeological problems such as water inrush, which pose potential threats to the stability and safety of urban tunnels. This paper investigates the impact of karst geological water inrush on urban tunnels through a combination of field monitoring and numerical simulation methods, and proposes corresponding grouting water-blocking solutions. Research findings demonstrate that: based on deformation rates at different locations, the deformation throughout the entire monitoring period can be categorized into three distinct stages, namely a rapid change stage, a slow development stage, and a stabilization stage; a cavity water head of 10 m can be established as the critical threshold; water inrush occurs when water source pressure exceeds 0.5 MPa, with the inrush volume increasing continuously as pressure rises; and water inrush also occurs when filler thickness is less than 10 m, with the inrush volume increasing continuously as thickness decreases. Implementation of the grouting water-blocking scheme effectively controlled water leakage during tunnel excavation and support, ensured construction quality, reduced idle time and waste of construction personnel and equipment, and yielded cost savings.

## Full Text

## Preamble

**Research on the Impact of Karst Geological Water Inrush on Urban Tunnels and Grouting-Based Water Blocking Schemes**

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## Abstract

Karst geological regions, characterized by their unique geological structures and landforms, frequently encounter hydrogeological problems such as water inrush, which pose potential threats to the stability and safety of urban tunnels. This paper investigates the impact of karst geological water inrush on urban tunnels through a combination of field monitoring and numerical simulation methods, and proposes corresponding grouting-based water blocking schemes.

The research results indicate that based on the deformation rate at different locations, the deformation during the monitoring period can be divided into three stages: a rapid change stage, a slow development stage, and a stabilization stage. The karst cavity water head of 10 m can be considered as the critical value. Water inrush occurs when the water source pressure exceeds 0.5 MPa, and the water inrush volume increases continuously with increasing water source pressure. When the filling material thickness is less than 10 m, tunnel water inrush occurs, with the water inrush volume increasing as the filling thickness decreases. The implementation of grouting-based water blocking schemes effectively controlled water seepage during tunnel excavation and support, ensured construction quality, reduced idle waste of personnel and equipment, and achieved cost savings.

**Keywords**: karst geology; water inrush; urban tunnel; grouting for water blocking

*Note: Figure translations are in progress. See original paper for figures.*