

TITLE: Bayesian updating for spatially variable geotechnical parameters in shallow soil-tunneling mechanics			
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ABSTRACT {in approximately 200 words}:

Mechanical behavior simulation for surrounding soil mass is a significant challenge during shallow-buried shield tunneling. Elastic-plastic deformation of surrounding soil mass causes progressive deterioration of ground surface settlement, and impacts the excavation safety. This paper addressed the spatial variability of geotechnical parameters. Coefficient of cohesion, internal friction angle and Young's modulus are the primary goals. Data of the site characterization coexists of a few reconnaissance observations and a wide range of field measurements. Spatial Bayesian framework is conceived to assimilate systematically the direct data, indirect data, and prior knowledge for the geotechnical parameters, as well as the mechanics model bias. There are three key components: multivariate spatial random field, nonparametric likelihood method and forward analysis. Posterior distributions of the unknown variables would be used into the subsequent mechanical calculation, and updated dynamically following new field measurement acquisition. This approach is applied into the paralleling zone of four shield tunnels of the 5th and 6th metro lines intersecting to Huanhu W Rd station, Tianjin China. Results prove that the updated variables would support more consistent predictions.

Keywords: Geotechnical Parameter, Spatial Variability, Bayesian Method, Shield Tunneling, Ground Surface Settlement.

Preferred Session/Topic (You can check more than one box):

- ☒ Bayesian methods
- ☐ Climate change related impacts
- ☐ Climate resilience of infrastructure
- ☐ Coastal Management System
- ☐ Damage Analysis and Assessment
- ☐ Decision analysis
- ☐ Durability & Life-Cycle Analysis
- ☐ Economics of resilience
- ☐ Environment Management System
- ☐ Extreme value analysis for hazards affected by climate change
- ☐ Geotechnical Reliability
- ☐ Infrastructure adaptation to a changing climate
- ☐ Imprecise probabilities
- ☐ Measurement science and metrics for resilience
- ☐ Measurement science and metrics for sustainability
- ☐ Natural and Man-Made Hazards
- ☐ Performance-Based Design Methods
- ☐ Random Vibrations
- ☐ Reliability-Based Optimization and Control
- ☐ Reliability Theory
- ☐ Risk Assessment Models
- ☐ Risk Communication
- ☐ Robustness
- ☐ Socioeconomic aspects of resilience and sustainability
- ☐ Stochastic Finite Element Analysis
- ☒ Stochastic Mechanics
- ☐ Stochastic Dynamics and Controls of Engineering System
- ☐ Superstructure Management System
- ☐ Sustainable Construction Technologies
- ☐ Transportation System
- ☐ Water Supply Network
- ☒ Uncertainty Quantification
- ☐ Underground Space