

Modeling Shield-Ground Interaction in Heterogeneous Ground: A Finite Element Framework and Validation

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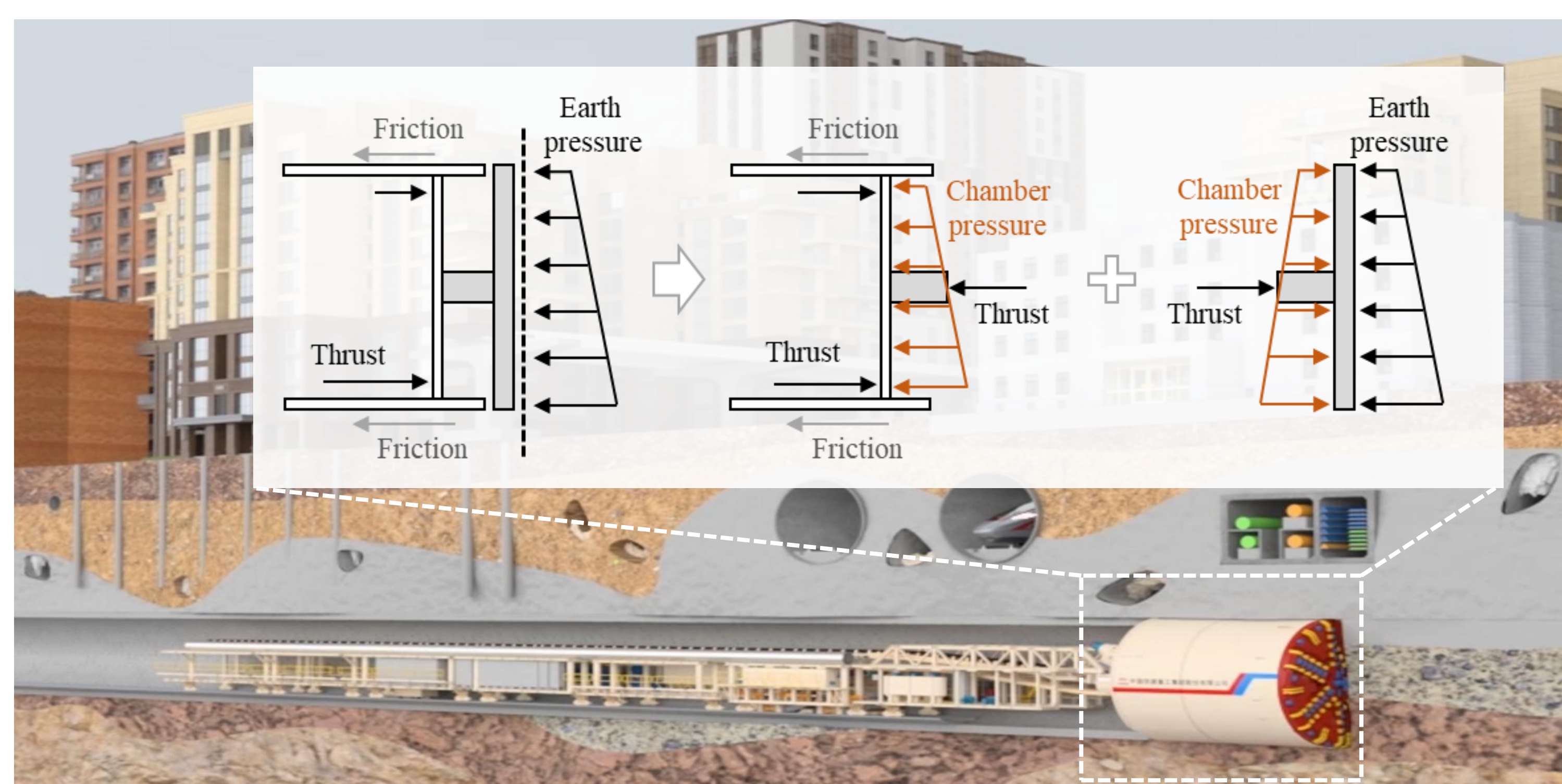
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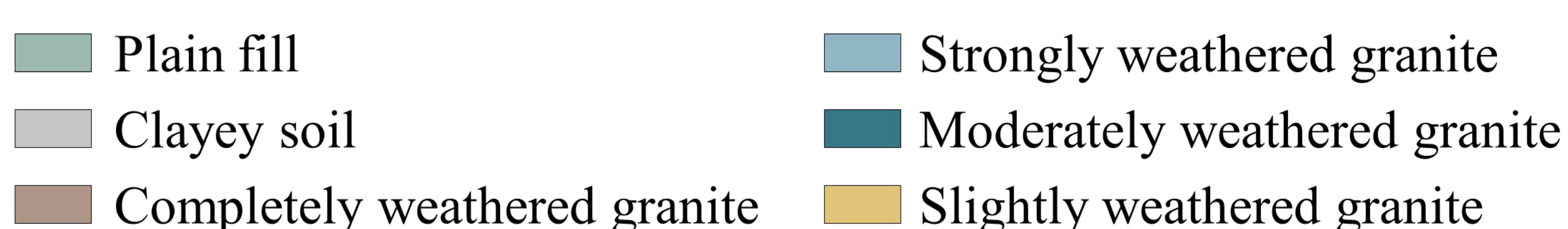
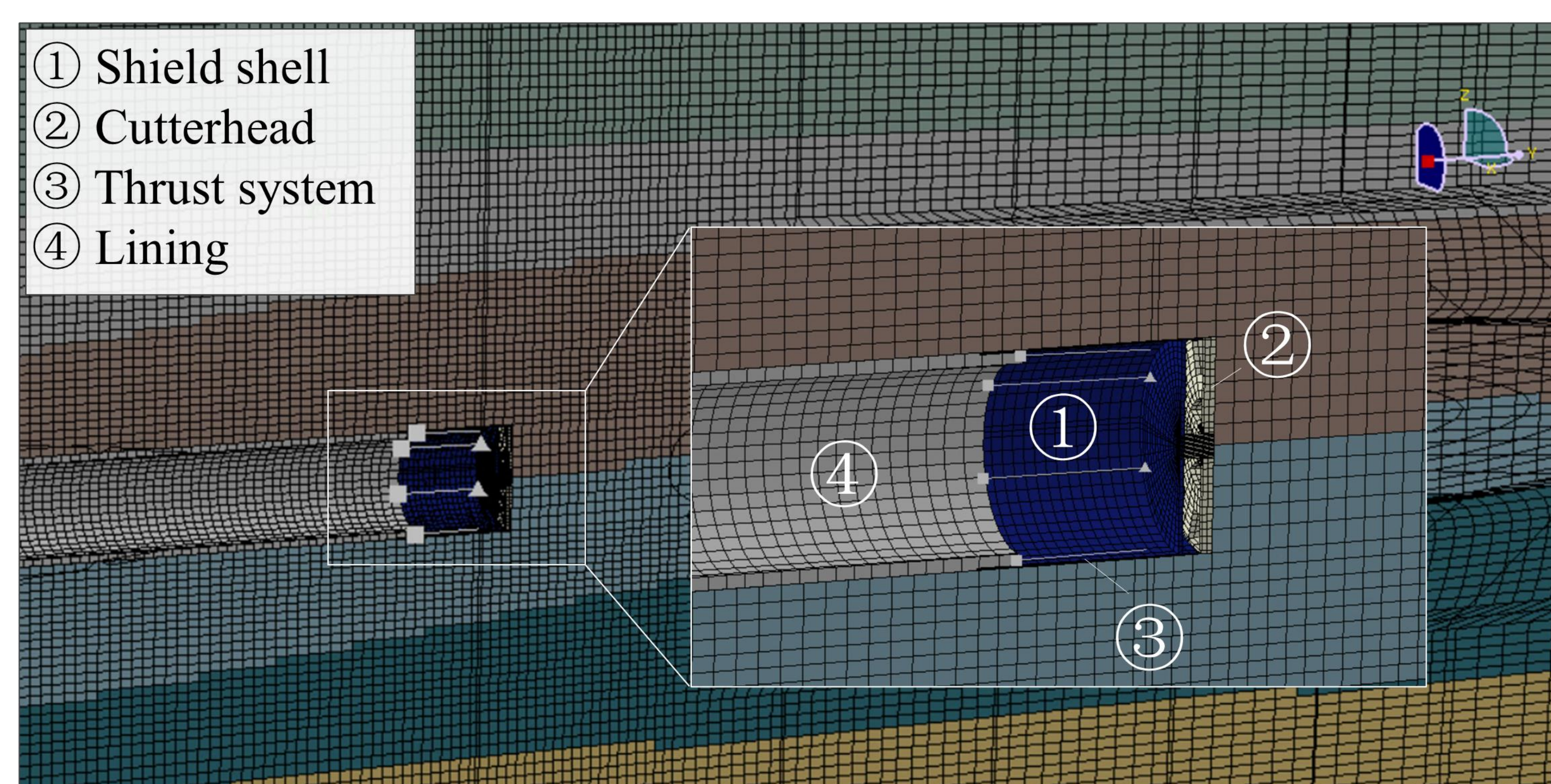
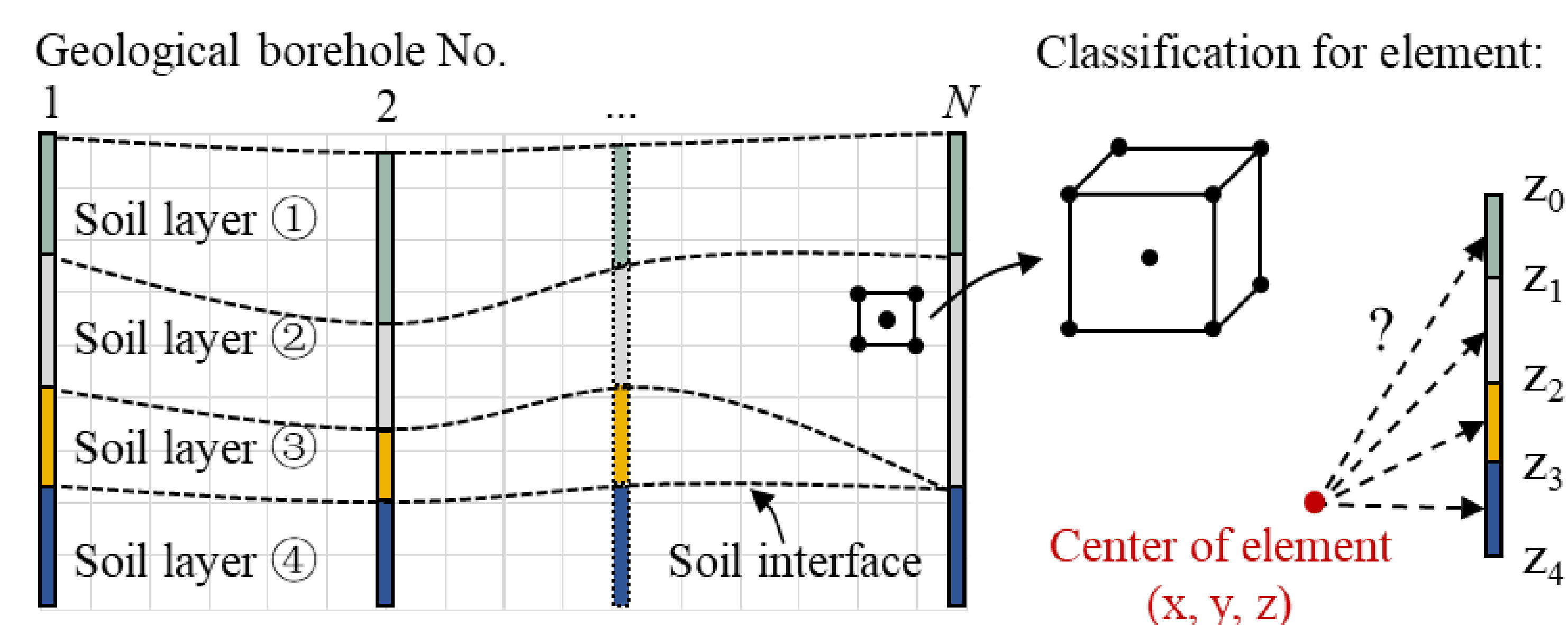
Introduction

- Shield-ground interaction during mechanized tunneling governs load transfer between the shield shell, cutterhead structure, and surrounding ground, thus determining the loading conditions and long-term performance of critical components such as the cutterhead and main bearing.

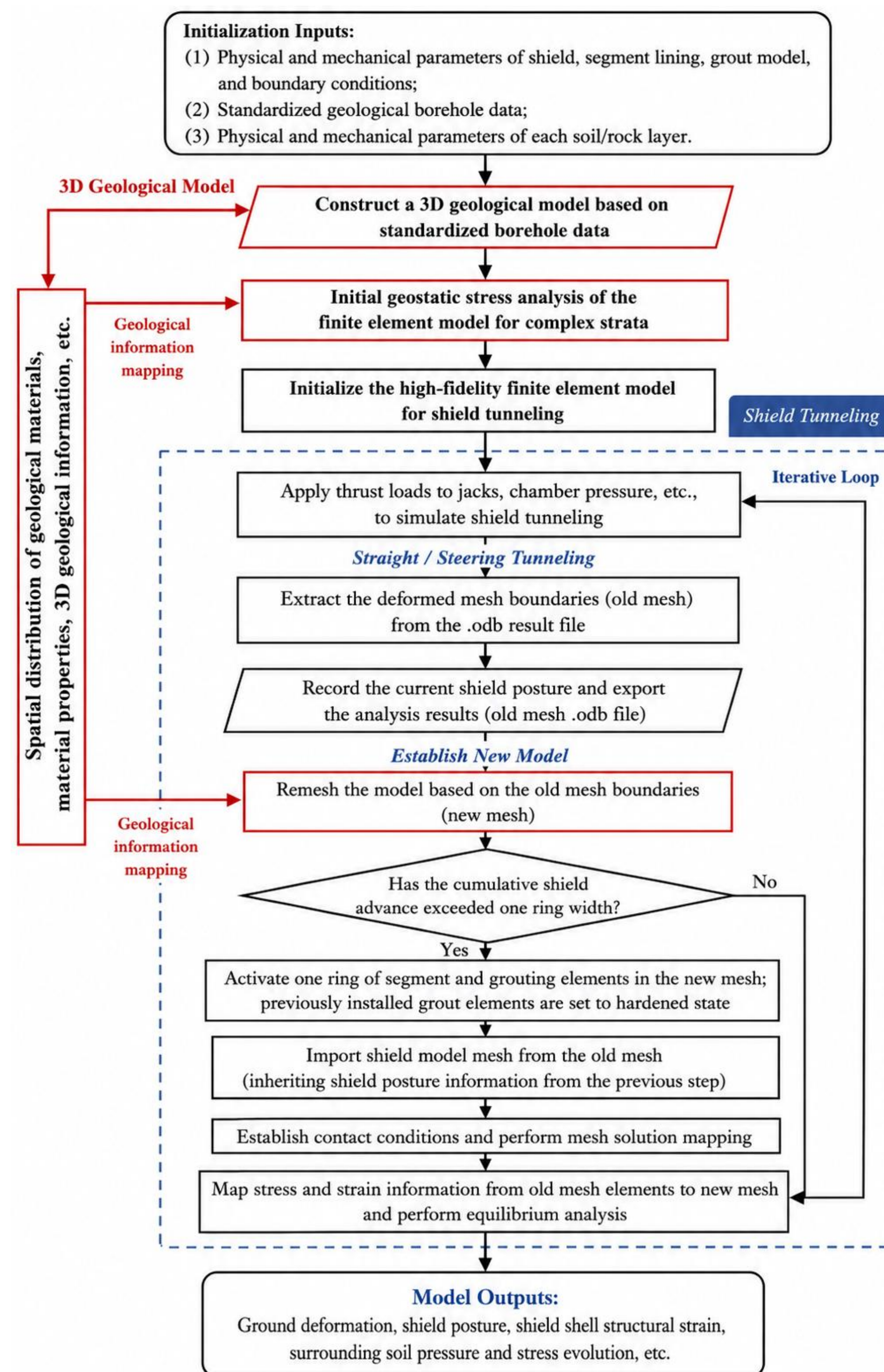


Methods

✓ 3D Geological modeling and mapping



✓ Simulation framework for shield tunneling



Results and Conclusions

- The proposed model is quantitatively evaluated using a comprehensive field dataset collected from the Shenzhen-Huizhou intercity railway.
- The results demonstrate that the model can reproduce the mechanical response of the shell structure and cutterhead under composite ground conditions. The predicted cutterhead-soil interaction can provide a mechanical basis for the design of the cutterhead and main bearing.