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Numerical modelling of polymer support fluids permeating in sands

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Polymer fluids, a blend of polymers in water, offer a cost-effective and environmentally friendly solution for supporting deep underground excavations. However, being non-Newtonian fluids, their full potential in construction projects is hindered by a limited understanding of their behaviors. In this study, we will employ a combined approach of DEM-based and micro-CT imaging techniques to explore the pore-space topology in sands. Utilizing this data and considering the fluid-solid interaction, we will then develop a fully-resolved numerical model to comprehensively investigate the distribution pattern of strain and stress within the fluid phase, as well as drag forces on sand particles. Our numerical results will be validated against large-scale experimental observations, and provide insights for the development of upscaling modelling techniques.

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References

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