

A Meshfree Stabilized Collocation Framework for Large-Deformation Impact Analysis



Suwan Cheng, Magd Abdel Wahab
 Faculty of Engineering and Architecture, Ghent University, Belgium

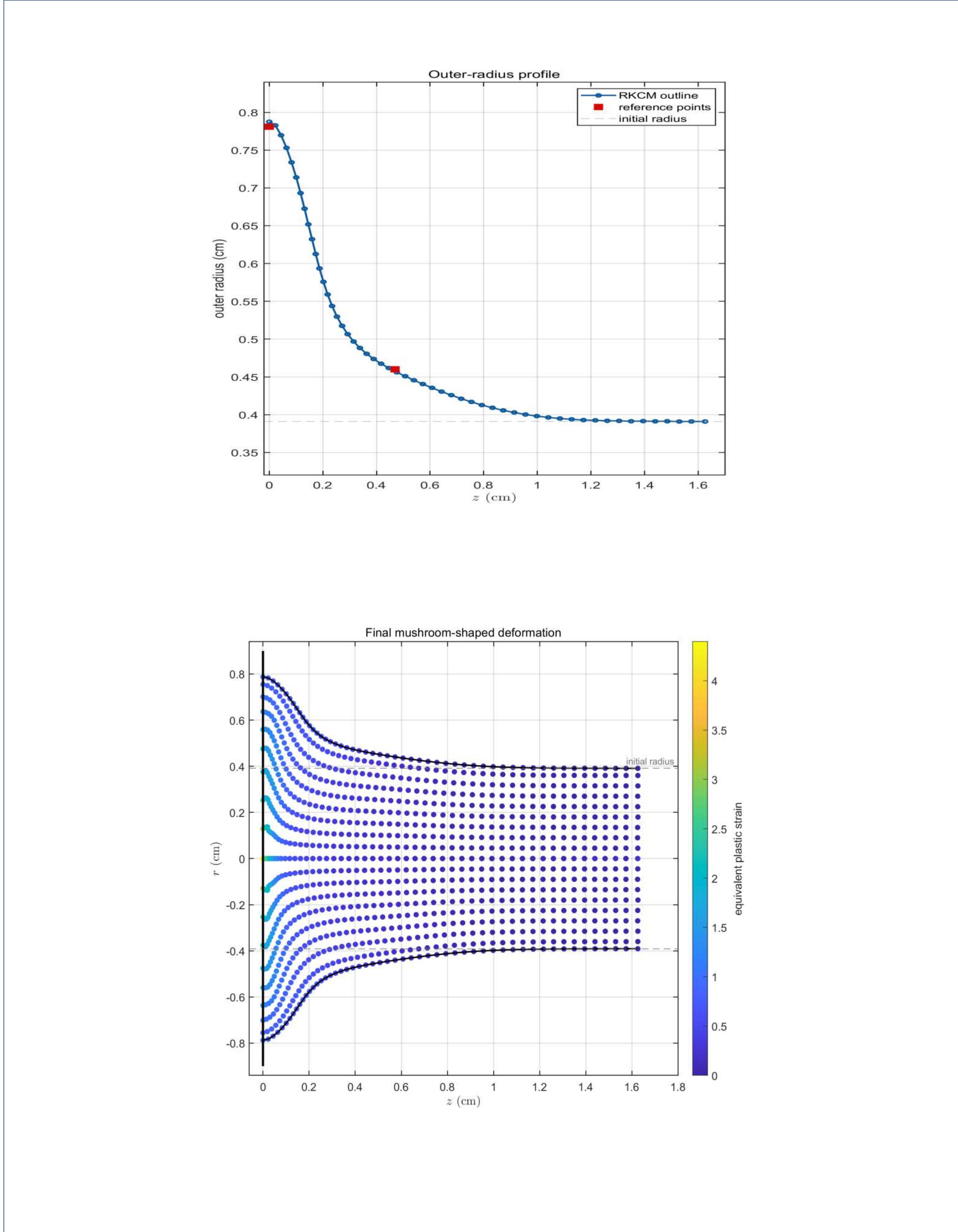
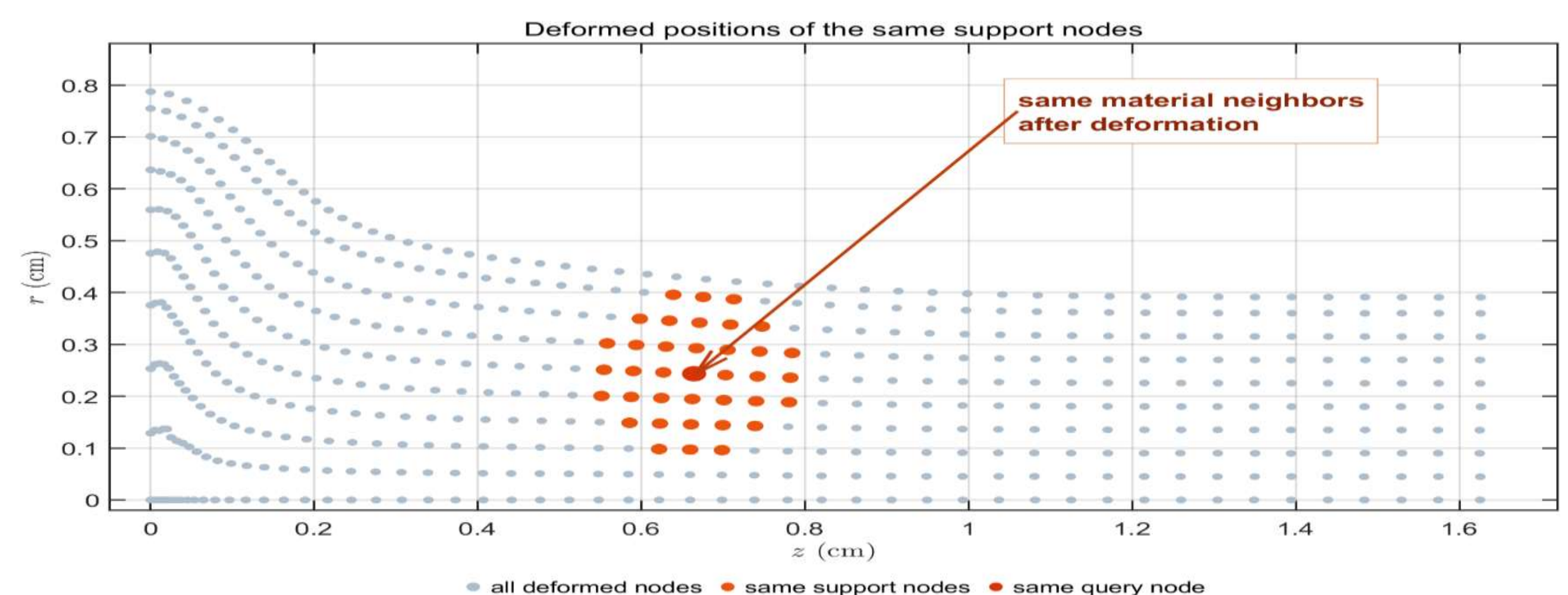
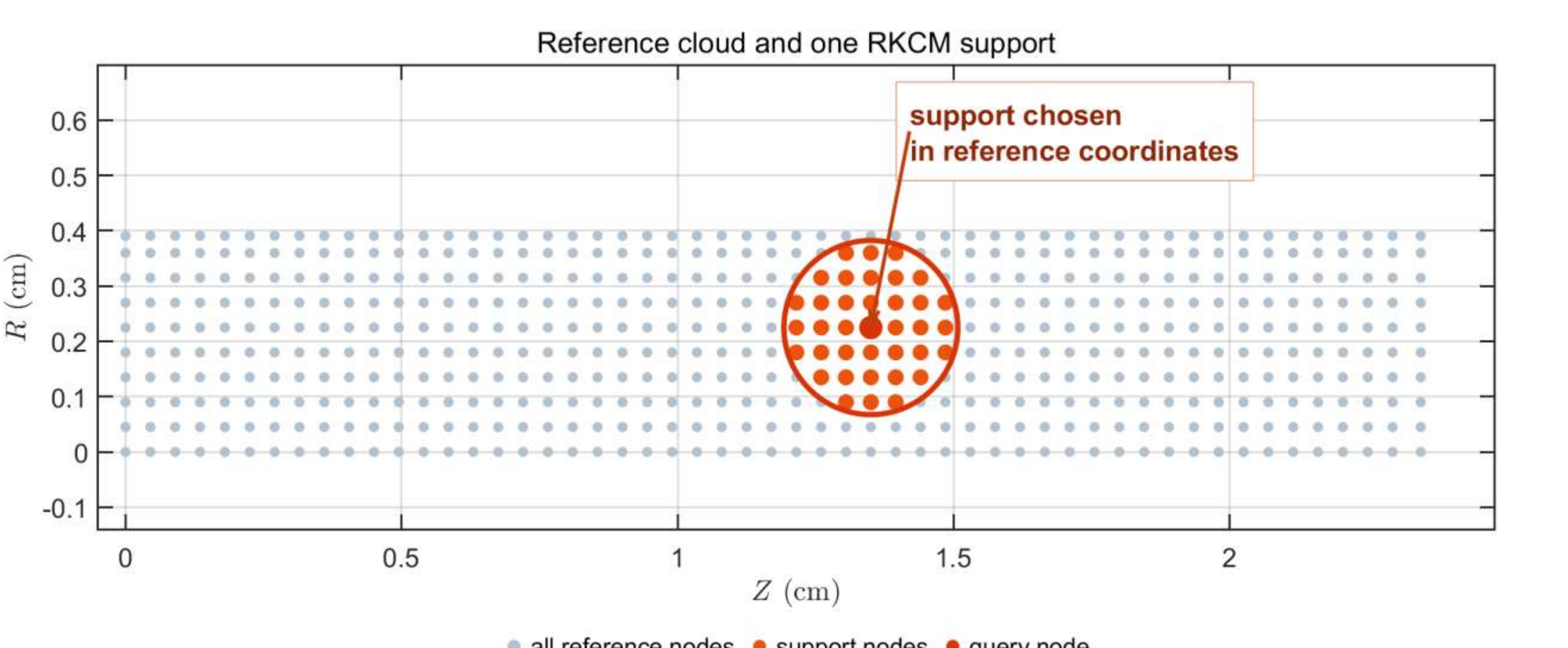
Introduction

Composite laminated plates are widely used in lightweight impact-resistant structures. Accurate dynamic impact analysis requires a stable numerical method capable of handling large deformation, contact, and high-gradient stress fields. This study develops a meshfree stabilized collocation method for impact dynamics, with future application to composite laminated plate structures.

Methods

- Meshfree stabilized collocation method
- Explicit central difference time integration
- Total Lagrangian formulation

Graphics / Images



Conclusions

A meshfree stabilized collocation framework was developed for dynamic impact analysis. The method combines a Total Lagrangian formulation, explicit time integration, and penalty-based contact treatment to simulate large-deformation impact problems. The hyperelastic impact and Taylor bar benchmarks demonstrate the stability and potential of the proposed approach. Future work will focus on extending the formulation to composite laminated plates with different layup configurations and impact conditions.