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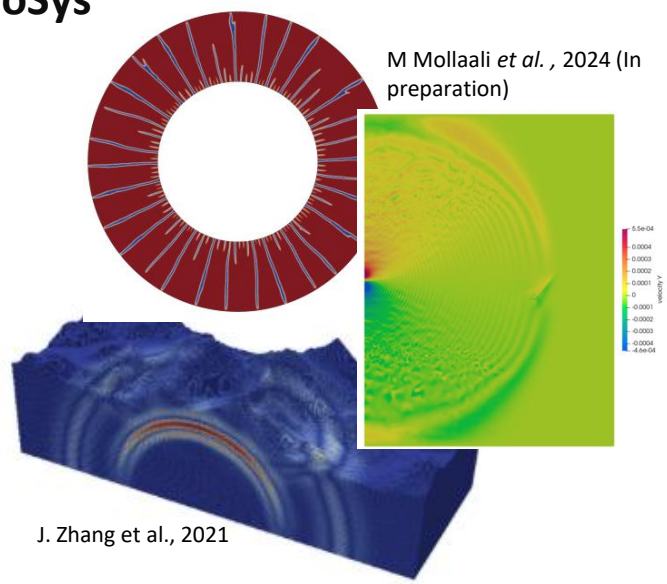
TU BERGAKADEMIE FREIBERG · TUBAF
Die Ressourcenuniversität. Seit 1765.

UFZ HELMHOLTZ Zentrum für Umweltforschung

Topic

# Elastodynamic Wave Propagation Modeling with Absorbing Boundary Conditions in OpenGeoSys

**Background:**
Elastodynamic wave propagation is a critical area of study in solid mechanics, focusing on the behavior of waves traveling through elastic media. This phenomenon is fundamental to understanding how materials respond to dynamic loading, such as impacts, earthquakes, or other rapid disturbances. Unlike static or quasi-static conditions, elastodynamic analysis considers the inertial effects and time-dependent aspects of wave propagation, providing a more comprehensive understanding of material behavior under dynamic conditions for some application such as fracture propagation, induced fault activation, seismic exploration and earthquake prediction.



M Mollaali *et al.* , 2024 (In preparation)

J. Zhang et al., 2021

This study will incorporate absorbing boundary conditions, such as Perfectly Matched Layer (PML), to enhance simulation realism and accuracy. This feature is crucial for accurate dynamic modeling as it prevents boundary reflections, allowing for a smoother and more accurate depiction of wave propagation and stress distributions within the simulated materials. The elastodynamic model is already developed in OpenGeoSys (OGS). This project aims to develop robust absorbing boundary conditions in OpenGeoSys to simulate fracturing and failure of elastic materials under dynamic conditions.

**Your tasks:**

- Incorporating absorbing boundary conditions into the OpenGeoSys framework.
- Verification and benchmarking.
- Conducting simulations to study the behavior of elastic materials under dynamic conditions.

**What we expect:**

- Interest in learning about elastodynamic wave propagation.
- Interest in learning about numerical modeling techniques and the Finite Element Method.
- Basic programming knowledge (*e.g.* C++).

**What you can expect:**

- Support and initial training in the use of OpenGeoSys (OGS).
- Choice to work in Freiberg or Leipzig

**Curious**? Get in touch!

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