

# Master's Thesis (MA, 30 ECTS)

## Comparative simulations with UNWEDGE and 3DEC regarding block instabilities under secondary stress conditions

### Description

UNWEDGE (Rocscience, Inc.) is a 3D visualization and analysis tool to determine block instabilities in underground works due to critical joint intersections. With this programme, it is possible to analyse wedge instabilities, generated by the intersection of three different joint sets easy and fast.

However, if the factor of safety is solely based on gravitational load, the orientation of the joint network and the joint properties, the applied approach might be very conservative, since it does not include the confining stress conditions due to the secondary stress state (SSS).

UNWEDGE provides the possibility to include the primary stress state (PSS) in the stability analyses using a boundary element method (BEM), based on an elastic joint material on each wedge plane and, in general, this approach results in higher factors of safety.

Based on exemplary cases, the implemented BEM in UNWEDGE shall be validated with the 3D distinct element code (3DEC, Itasca Consulting, Inc.). A critical comparison of the results from both numerical methods shall prove or disapprove the consideration of the PSS in the stability analyses of UNWEDGE.

For the thesis, the following steps shall be elaborated:

- Literature research on BEM, DEM
- Work with the programs UNWEDGE and 3DEC
- Determination of case studies (roof wedge/face wedge)
- Simulation of the case studies
- Analysis of the results
- Comparison and discussion of the results from both models
- Writing of a technical report acc. to the guideline for scientific writing (FMT homepage)

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**Start**                by appointment

**Duration**          app. 6 months

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