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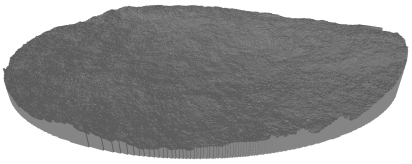
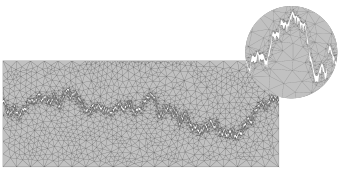
# Studienarbeit (Specialization project)

## Contact between natural fracture surfaces - finite element simulation

Rough contact between fracture surfaces of natural rocks is not only of scientific but also of economic interest in the context of hydraulic fracture as a means of oil and gas mining. An important parameter is the contact compliance: how much will the crack close if we load the - no longer conforming - crack surfaces. This in consequence determines the hydraulic conductivity of the crack. There exist theoretical results for rough contact, but their scope of application is limited. We would therefore like to investigate the process numerically by finite element simulation.



A sandstone fracture surface



Finite element contact simulation

In this work the influence of the surface topology (roughness spectrum) on the contact compliance shall be investigated. To that end, non-conforming rough surfaces (in 2D) are generated and the contact is simulated by the finite element method. Finally. the contact behavior is compared with existing experimental data.

Requirements: being able to use finite element software (e.g. Abaqus), programming skills (Matlab, Python or Julia).

**Tasks**

- Create surface topologies from roughness spectra as well as simplified geometries
- Import the geometry to finite element software and set-up the model
- Run simulations, export the load-displacement relation
- Compare with experimental data

Examples are available in Matlab and Abaqus (Python).