

# 7<sup>th</sup> 3D geological modelling meeting in Warsaw 2025 – Minutes of breakout session on **Transition to Hard Rock Modelling**

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*Chair: Sascha Görne*

## **Key Differences: Sedimentary Basins vs. Hard Rock**

- Seismic Data
  - Often no seismic data available in hard rock settings
  - When present, seismic data lacks clear reflectors
- Geophysical Methods
  - Gravity and magnetic data may help, but hard to interpret
- Modelling Tools
  - SKUA/GOCAD: modelling performed manually → bad meshing
  - Leapfrog: efficient for identifying intrusive bodies → valid meshes
    - Strength: visualization of intrusive features
    - Weakness: limited fault representation

## **Applications of hard-rock models**

- Exploration and development of petrothermal geo-energy
- Planning for radioactive repositories (e.g., in the UK)
- Derivation of geological maps from models
- Exploration of raw materials

## **(Field) Methods**

- Structural measurements: essential for understanding deformation in hard rock regions
- Geomorphology: used as a supporting tool

## **Data Considerations**

- Incorporation of rock properties instead of relying solely on stratigraphy
- Emphasis on implicit modelling approaches
- Models must accommodate non-stratigraphic frameworks

## **Challenges**

- Complexity of the geology
  - Highly deformed metamorphic rocks
  - Presence of folds and faults
- Modelling limitations
  - Requires multiple iterations to enhance model quality
  - Limitations of geostatistical methods
  - High degree of uncertainty due to limited direct data

## **Current Limitations**

- Tool capabilities: existing software may not fully support hard rock environments

- Data constraints: lack of deep boreholes and limited seismic datasets

## Collaboration & Research

- Importance of collaboration across disciplines
- Participation in EU research projects to enhance synergies and innovation

Whiteboard notes:

