

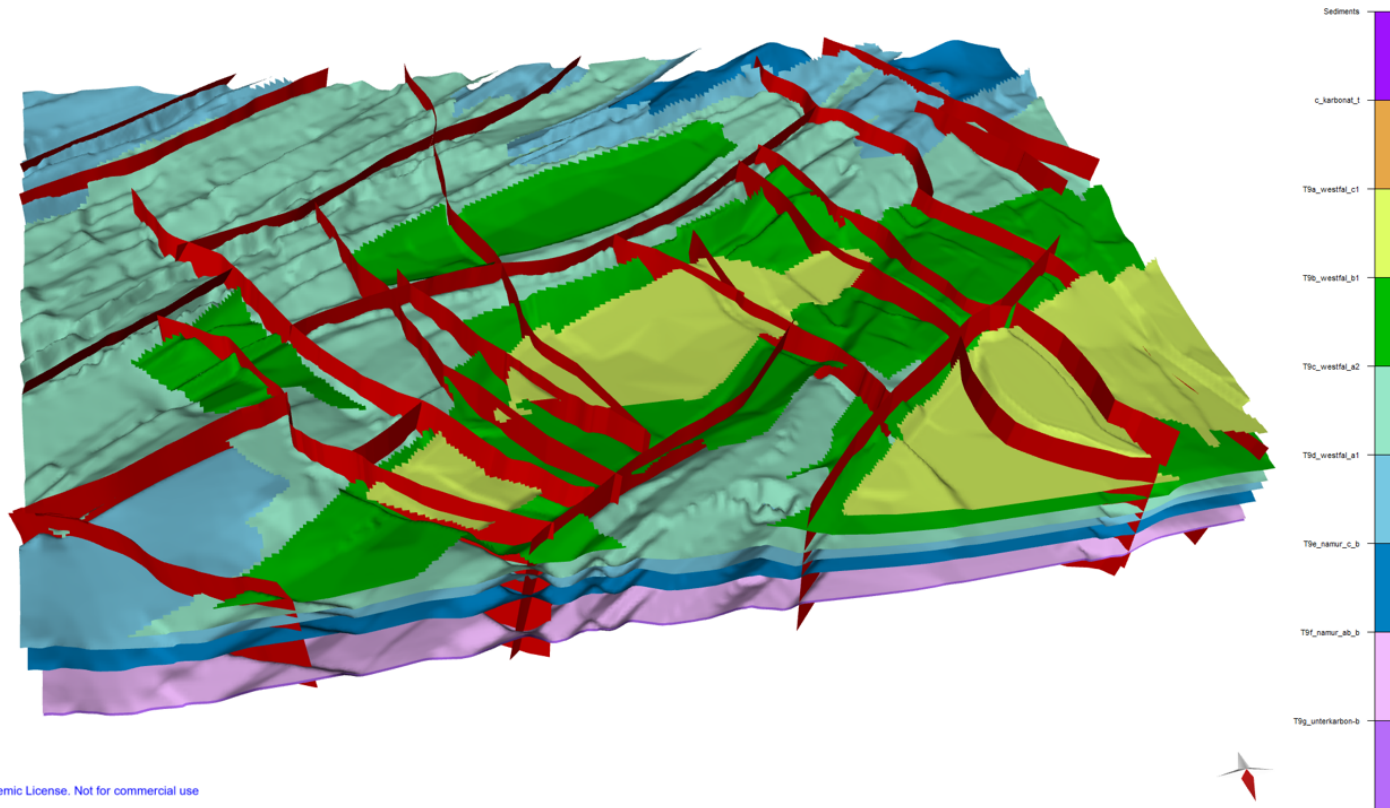
# Establishing a 3D model for the Rhine-Ruhr region based on the geology and property distribution

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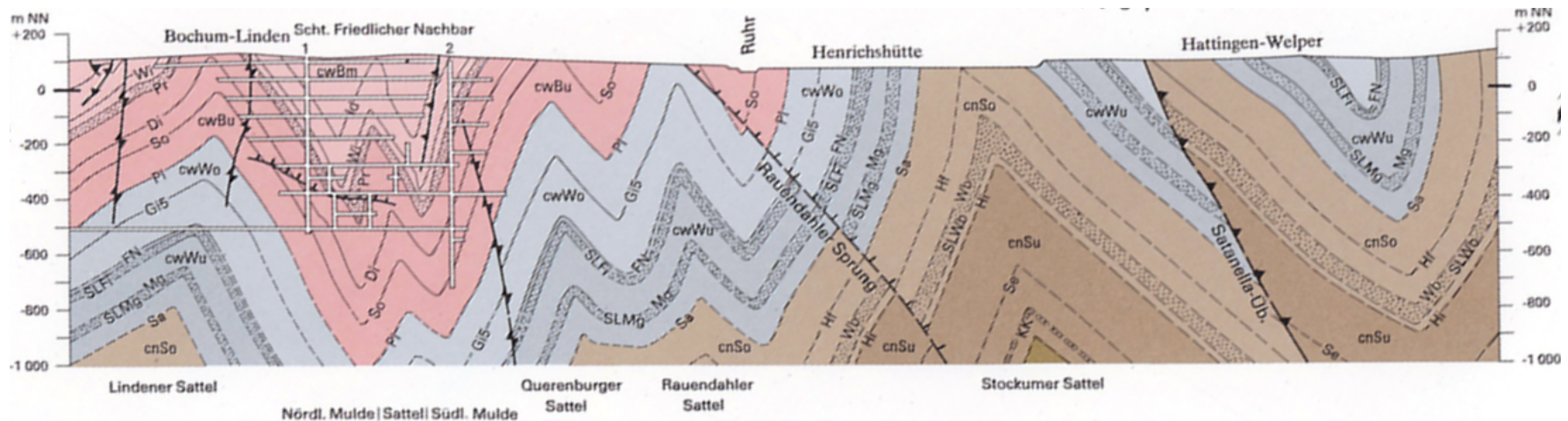
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# Introduction

- The Rhine-Ruhr region is located in the state of North Rhine-Westphalia in western Germany.
- The transition to green energies requires exploration for regions with geothermal potential.
- One challenge is the complex geology, for example the intense folding.



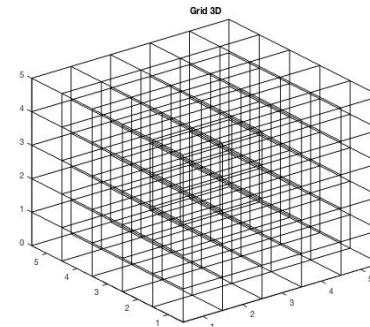
# Objective

## ■ Objectives

- Built a geological model as accurate as possible.
- Base model for:
  - properties distribution
  - Simulation of wave propagation.

## ■ Considerations

- Wave propagation simulations based on finite element method, regular grid.
- Large area
  - 35 km x 22 km and 6 km depth, millions of elements.

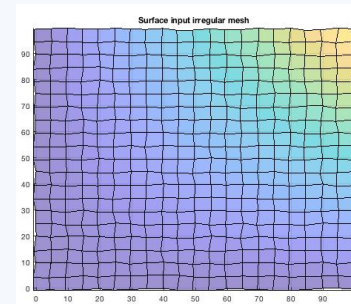


# Methodology

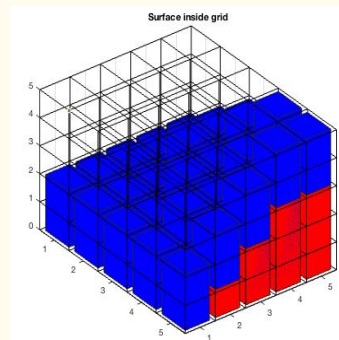
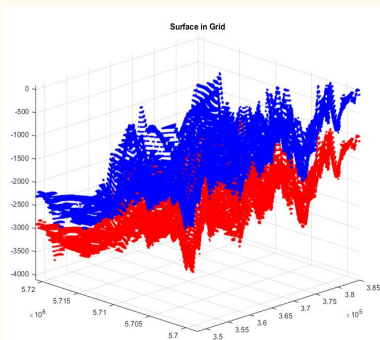
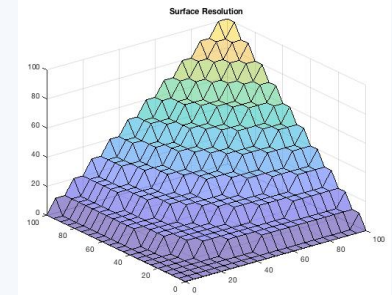
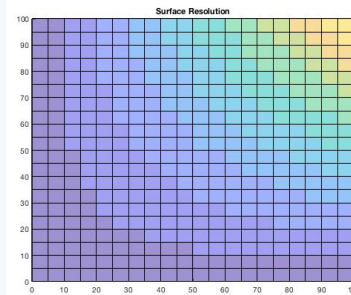
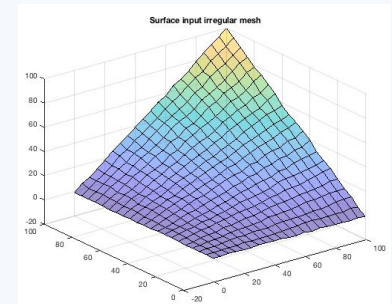
## Grid construction

- From an irregular mesh to a regular equal space mesh.
- Spatial resolution.
- Scale model of the surfaces
- Surfaces as layer's top, each grid layer represent a geological unit.

*plan view*



*lateral view*



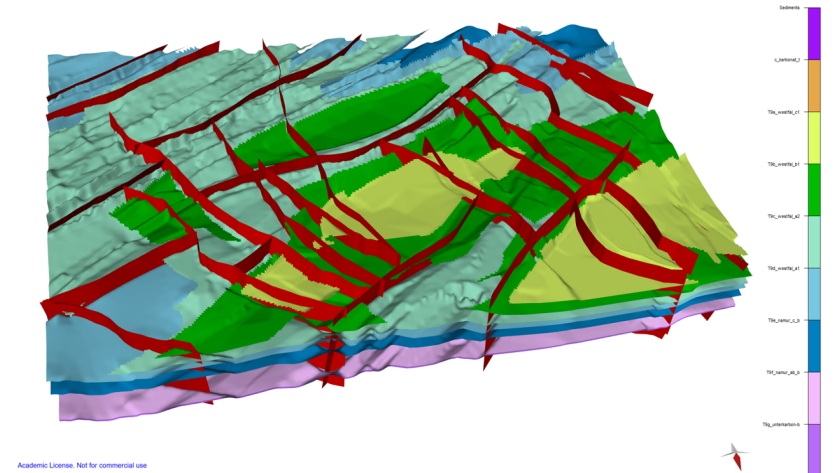
Author's script using  
MATLAB due to the  
flexibility for millions of  
elements.



# Milestone

- Heterogeneous model representing the geological structure.
- The first stage is a basic properties distribution with isotropic layers.
- The definition of the spatial resolution is necessary to find a balance between the accuracy of the model, property scaling and computational efficiency.
- **Further Work**
- Anisotropic distribution of properties, supplement from well logs, laboratory measurements and literature.

Geological model in MOVE



Geological model in MATLAB

