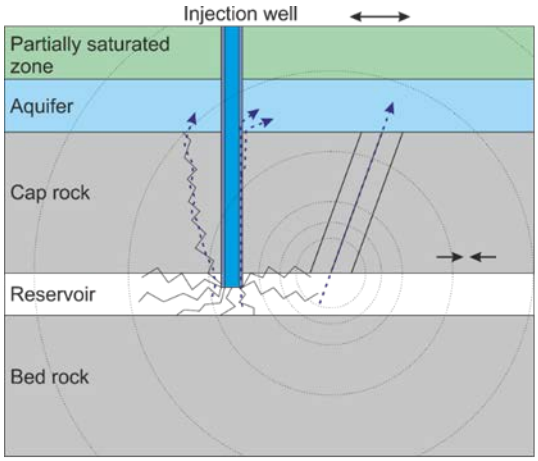
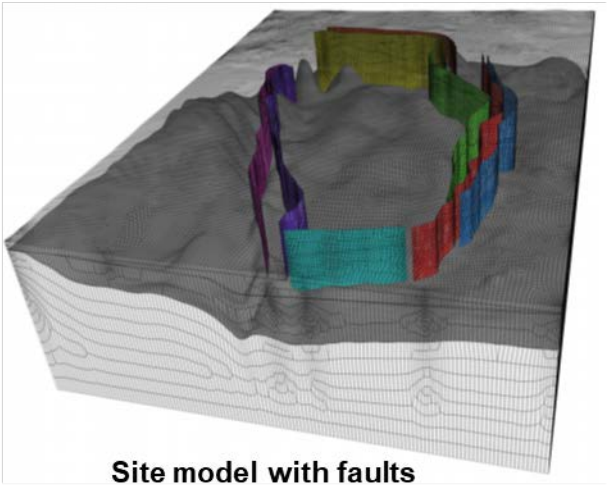
# Risk analysis of induced seismicity related to the use of deep geological bedrock

## Aim of the research project

The research project carries out an integrated risk analysis on the basis of coupled simulations. In the context of the realisation of deep geothermal projects as well as gas storage projects numerous risks have to be considered. A significant risk is the induced seismicity as a result of plant operation or in the context of stimulation. In unfavorable cases, seismic events caused by large-scale changes in the stress field can result in damage to buildings and even landslides within a radius of 10 – 15 km. The main cause of such microquakes is considered to be existing geological faults whose effective stress state is reduced to such an extent that shear failure occurs as a result of exceeding the fracture criterion. Such a reduction can occur due to the increase in pore pressure in the region of a perturbation.



**Basic concept GEOSMART**


**Site model with faults**

## Approach

Numerical simulations are carried out in which the shear parameters of the existing faults are reduced to a lower value after their shear strength has been reached. The reduction causes shear failure at the faults and plastic displacements occur. To compare the seismic events, the seismic moment $M_0$ is calculated, which can be converted into the moment magnitude $M_W$. In order to determine the influence of the rock parameters, dynamic simulations are carried out in which the wave propagation in the rock is mapped. With the help of EC 8 and DIN 4150 a risk assessment is finally developed.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