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# Combined geoscientific investigations of geothermal reservoir characteristics in Lower Saxony, Germany

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The North German basin provides a significant geothermal potential, although temperature gradients are moderate. However, deep drilling up to several thousand meters is required to reach temperatures high enough for efficient generation of electric power. In these depths we have not much information yet about relevant physical properties like porosity or permeability of the rock formations. Therefore the costs of developing a geothermal reservoir and the risk of missing the optimum drilling location are high.

The collaborative research association "Geothermal Energy and High Performance Drilling" (gebo) unites several universities and research institutes in Lower Saxony, Germany. It aims at a significant increase of economic efficiency by introducing innovative technology and high tech materials resisting temperatures up to 200 °C in the drilling process. Furthermore, a better understanding of the geothermal reservoir is essential.

gebo is structured into four main fields: Drilling Technology, Materials, Technical Systems and Geosystem. Here, we show the combined work of the Geosystem group, which focuses on the exploration of geological fault zones as a potential geothermal reservoir as well as on modeling the stress field, heat transport, coupled thermo-hydro-mechanical processes, geochemical interactions and prediction of the long-term behavior of the reservoir. First results include combined seismic and geoelectric images of the Leinetalgraben fault system, mechanical properties of North German rocks from field and laboratory measurements, chemical contents of North German formation fluids, stress models for specific sites in northern Germany and modeling of permeability and heat transport in different (fractured) media.

A common work package of all gebo Geosystem projects are benchmark models – a set of models of geothermal reservoirs (e.g. deep aquifer, fault zone within sediment layers, ...) that are specific and realistic for Lower Saxony. They are defined by geometry and physical parameters and are the basis for interdisciplinary cooperation between the different subprojects. They can be used for numerical simulations and define general conditions also for the other focus areas of gebo. Here we will discuss the benchmark model "Horstberg", which is derived from 3D seismics and characterizes a fault zone in a typical, simplified north German sediment succession.

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