



3-D reflection seismic exploration at the geothermal research platform in Groß Schönebeck north of Berlin (project RissDom)

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The extraction of hydrogeothermic energy from deep wells is assigned a great relevance in energy transition, and therefore scientifically tested and developed. The largest cost factor for geothermal projects is deep drilling, and 3-D seismic acquisition is used in advance for exploration and optimization of drill paths.

In February and March 2017, high-resolution 3-D reflection seismic measurements accompanied by VSP measurements in 2 existing research wells were conducted in the vicinity of the geothermal research platform Groß Schönebeck of the German Research Centre for Geosciences (GFZ) Potsdam. The investigation area lies ca. 50 km north of Berlin, on the southern edge of the North German Basin. The site serves as a reference for the development of geothermal technologies, and the seismic investigations aim at providing a detailed image of the target region.

Model calculations for planning an optimal measurement configuration revealed theoretical line distances of 400 m for the receiver and 700 m for the source positions. The point spacing on the lines was chosen to be 50 m for sources and receivers, in order to avoid spatial aliasing with regard to existing layer inclinations, and to ensure sufficient vertical and horizontal resolution after migration. The seismic contractor performing the measurements was DMT GmbH & Co. KG, Essen. All theoretical source and receiver points could be realized with only moderate transfers and hardly any failures. The seismic source consisted of four simultaneously working vibrators with a peak force of 200 kN each, which after extensive start-up tests emitted 8 sweeps (12 sec long, 12-96 Hz) at each source location. The measuring program of a total of 1832 source positions and 3240 receiver positions took 17 acquisition days.

The resulting data volumes show an extraordinarily high data quality with spatially well-observable, reflective layer boundaries in the subsurface (also subsalt). Within the framework of the seismic interpretation, these are now assigned to the geological formations, examined for fault systems and analyzed spatially consistently in their 3-D structure. Also, work is being done to improve seismic processing, especially in reservoir depth at ca. 4 km. Pre-stack depth migration is designed to produce a sharper image of the subsurface in order to provide a solid foundation for geological interpretation and kinematic modeling, and to validate statements on the use of deep geothermal resources in the North German Basin.