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Reduce the risk of finding a deep geothermal reservoir by means of 3D seismics

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There is a large potential of geothermal energy to contribute to the total energy supply in Germany. Ground source heat pumps are already accepted by a growing number of homeowners in addition to conventional heating systems. Still geothermal power plant projects suffer from the risk of finding proper deep geothermal reservoirs, i.e. a subsurface region with high temperatures and favourable petrophysical conditions to form a large natural heat exchanger. Drilling boreholes to 3000m - 5000m depth is expensive which affects a possible investment. A common way to reduce this risk is the application of seismic methods as successfully done for decades in oil and gas exploration.

For this study we examine open questions concerning the use of 3D land seismic in geothermal reservoir exploration: First of all, do we really need expensive 3D seismic information or would well placed seismic profiles suffice this purpose? Secondly, which seismic resolution do we need for the specific geothermal reservoir? Thirdly, do we need special methods to model facies, to map lithologic parameters or identify systems of fissures in the context of geothermal energy exploration? And at last, which relevant information do we get from vertical seismic profiles (VSP) or moving source profiles (MSP)?

At the moment there are three major regions in Germany which are promising for deep geothermal energy supply. (1) The karstified limestones of the Malm formation below the south German Molasse Basin, (2) the fractured units of the Muschelkalk and the Buntsandstein in the Upper Rhine Graben and (3) the Buntsandstein in the North German Basin. For each of the three regions we are analysing a 3D seismic data

set and additional 2D seismic lines to answer the relevant questions.

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