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Magnetotelluric measurements in the vicinity of the Gross Schoenebeck geothermal site

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The EU funded project I-GET is aimed at developing an innovative strategy for a geophysical exploration of (geothermal) deep water systems. The strategy is to integrate all the available knowledge, from rock physics to seismic and magnetotelluric (MT) data processing and modelling. For geothermal exploitation, the detection of permeable zones and fluid bearing fractures is crucial. The magnetotelluric (MT) method is a natural-source electromagnetic method capable of imaging the subsurface electrical conductivity down to depths of several kilometers. Since electrical conductivity depends strongly on the presence of fluids, the magnetotelluric method is a very promising exploration technique for geothermal reservoirs.

The Gross Schoenebeck deep sedimentary reservoir is representative for large sedimentary basins all over Europe. A deep borehole is currently used as an in situ geothermal laboratory. The main objective of the geophysical site characterization experiments is to develop high resolution electrical conductivity images together with seismic tomographic models for a joint interpretation.

In this work we present results of the first MT experiments carried out in summer 2006. In this first phase of the experiments, MT data was collected along a 40 km-long profile. Data was collected at 58 stations with a site spacing of 400 m in the central part (close to the borehole) of the profile, increasing to 800 m towards the profile ends. The period range of the observations was 0,001 to 1000 s. At all sites, we recorded horizontal electric and magnetic field components and the vertical magnetic field.

The first models obtained from 2D inversion show a prominent conductive layer along the entire profile extending from depths of approximately 1 km in the south to 2.5 km in the northern part. This highly conductive zone seems to coincide generally with the

sedimentary layers of the Mesozoic. The model reveals furthermore two areas, to the south and north of the borehole, where the high conductivity appears to reach greater depths.