3-D fault development in a geothermal system in the German Molasse Basin

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The southern German Molasse Basin is one of the most promising areas for geothermal exploration in Germany. We aim for an optimized reservoir exploration for deep geothermal facilities in the Bavarian realm. To do this, we analyse seismic faults to characterise potential pathways between the Malm and its overburden, which consists of Molasse sediments.

A 3-D seismic survey (27 km_2) was interpreted as part of the research project GeoParaMoL (Geophysical Parameters for facies interpretation and Modelling of Long-term behaviour), in the study area at Unterhaching, Munich, Germany. GeoParaMoL is a partner project of GRAME, which aims to explore the hydrothermal Malm carbonate reservoir (at a depth of ca. 3 km) as a source for deep geothermal energy. First, we interpreted five seismic horizons and over 20 major faults. Here we present preliminary results of the derived 3-D structural model. We determined fault geometries and displacement profiles using isopach and juxtaposition maps.

We observe two different tectonic events: The faults within the Molasse sediments are unrelated to the faults of the underlying Malm carbonate platform. The faults within the Malm carbonate platform propagated up to the Top Eocene horizon (Lithothamien carbonates). The faults within the younger Miocene sediments developed subsequently. They dip, in part, with opposing dip direction, but mostly with the same strike. This basic information will be further used to predict fluid pathways by carrying out retro-deformation in the study area to help understand the structural development and regional tectonics. This work will support exploration of geothermal reservoirs in general.