Introduction

Based on its considerable burial depth and lateral continuity, the Permo-Carboniferous Rotliegend Unit in the northern Upper Rhine Valley represents a potential reservoir for low enthalpic geothermal energy. The Saar-Nahe Basin is an intracratonic basin of the Middle European Variscan orogen and is preserved below the Mesozoic intra-plate and the Tertiary Upper Rhine rift valley. In Permo-Carboniferous times, the surrounding Odenwald-Spessart and Taunus structural highs were source areas for the Saar-Nahe Basin. Rotliegend outcrops in the Saar-Nahe Basin provide analogue data for the deep subsurface Rotliegend units in today´s Upper Rhine Valley Methodology.

The database contains literature data and geological maps, providing stratigraphic transects and structural data for the Saar-Nahe Basin, the northern Upper Rhine Valley and the adjacent Tertiary Mainz Basin. Reprocessed 2D seismic surveys from the 1970s to 80s, together with recently acquired 2D seismic surveys and well data have been interpreted in this project. Based on checkshots, seismic data have been time-depth converted. The resulting subsurface model (Fig. 1) of the Upper Rhine Valley includes 10 stratigraphic horizons and a fault model, interpolated to 3D. Additionally outcrop analogue studies including field mapping and logging of field sections have been performed in the Saar-Nahe Basin for providing high resolution information for the facies development in the basin.

Further requested 2D seismic surveys and well data will be interpreted and integrated into the database. This will lead to a more precise structural und stratigraphical 3D model for a larger area covering the middle to northern Upper Rhine valley.

Integration of permeability and porosity data derived from well logs and outcrop analogue studies leads to the development of a thermo-hydraulic model of the area.

Application

The development of a 3D model consisting of structural and stratigraphic information builds the outline for seismofacies analysis. More detailed interpretation of certain stratigraphic layers is the first step towards a facies model. Supplemented by data from well logs and outcrop analogue studies a detailed model is build. Combined with hydrogeological data a thermo-hydraulic model of the subsurface units in the northern Upper Rhine Valley is in development.

Based on this model the spatial thermal development of the area will be simulated for reducing risk in the development of deep geothermal energy projects.

Conclusions

The Permo-Carboniferous Rotliegend units in the project area comprise an alluvial depositional system with coarse-grained sandstones and intercalated micro-conglomerates. Outcrop analogue analysis indicate, excellent reservoir and flow units with very good poroperm properties. A high lateral continuity exists in the deep subsurface of the Upper Rhine Valley fill. The static 3D model shows major faults with high vertical throw and increasing burial depths towards the northwest. The depth and the temperature data from wells indicate very good conditions for geothermal exploration. Intraformational fluid flow and connectivity along fault systems calculated in the thermo-hydraulic model comprise a geothermal setting with a long durability.

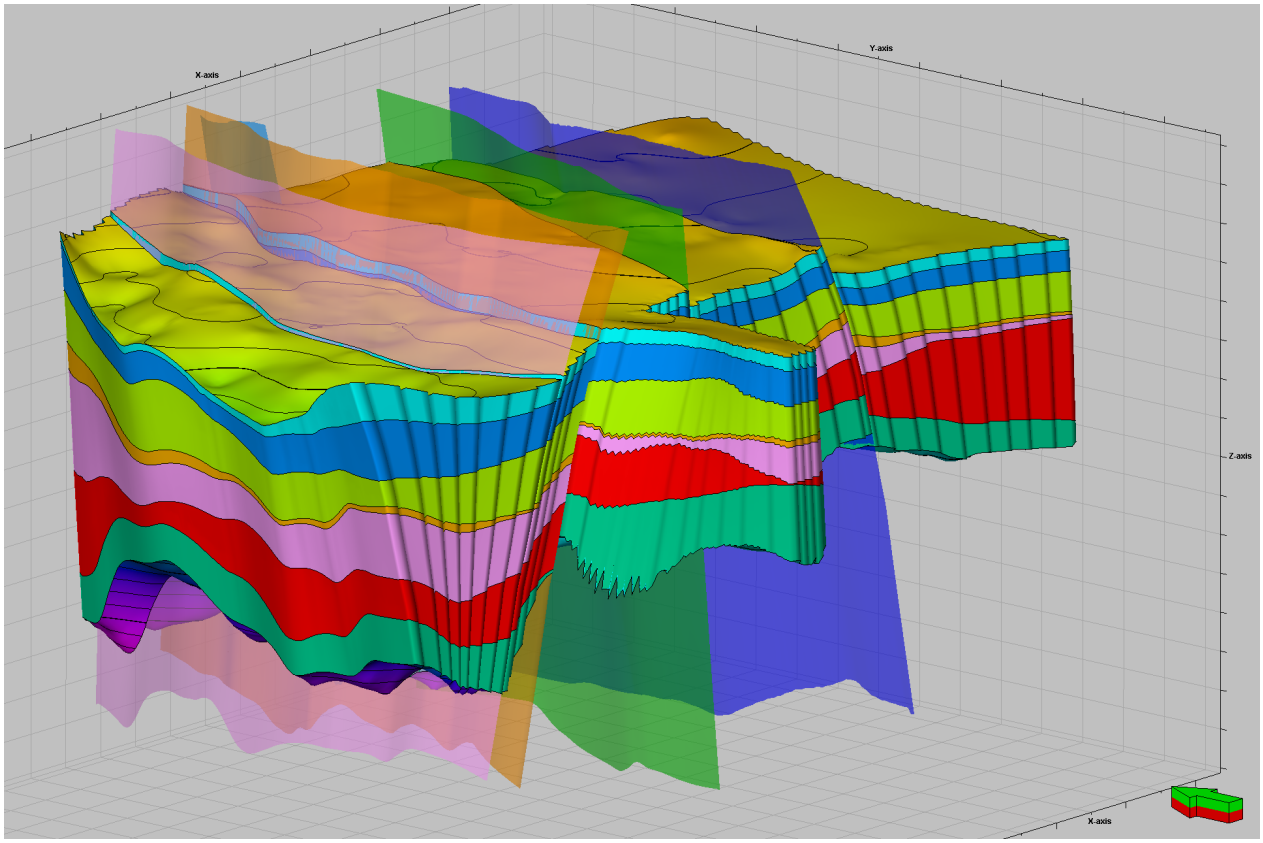

Figure 1: *Static 3D model of the northern part of the upper Rhine Valley viewed from South-West. Time-depth converted subsurface model of the project area. The eastern structural high and increasing burial depths towards the northwest are clearly visible. The basin fill has been subdivided to the Carboniferous (dark green), Rotliegend (red), Pechelbronn (purple), Septarienton (orange), Niederrödener (lime green), Ceritien (dark blue), Corbicula (light blue) Formations. Transparent colored surfaces indicate major fault planes.*

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