Geophysical Research Abstracts
Vol. 20, EGU2018-14451, 2018
EGU General Assembly 2018

Integrated assessment of the hydrothermal potential of the Pechelbronn Group in the northern Upper Rhine Graben

Meike Hintze (1,2), Barbara Plasse (1), Kristian Bär (1), Ingo Sass (1,2)

(1) TU Darmstadt, Applied Geosciences, Geothermal Science and Technology, Darmstadt, Germany , (2) Darmstadt Graduate School of Excellence Energy Science and Engineering, Darmstadt, Germany

The presented regional-scale assessment of the hydrothermal potential of the Pechelbronn Group in the northern Upper Rhine Graben is conducted within the scope of the joint research project “Hessen 3D 2.0” (BMWI-FKZ: 0325944). The project aims at evaluating the medium deep geothermal potential for direct heat and underground thermal energy storage (UTES) for the Federal State of Hesse, Germany.

The northern Upper Rhine Graben is due to its tectonic setting and the positive geothermal anomaly a key region for geothermal heat and power production in Europe. In this area the Upper Eocene to Lower Oligocene Pechelbronn Group reaches depths of up to 2800 m with temperatures of more than 100 °C. In order to assess the hydrothermal potential of the Pechelbronn Group an integrated dataset is evaluated. Petrophysical parameters are measured on core samples of eight boreholes (courtesy of Exxon Mobil). Additionally, 15 gamma-ray logs, 99 lithology logs as well as more than 2500 porosity and permeability data of some of these boreholes are available.
The Lower Pechelbronn Beds are composed of fluvial to lacustrine sediments, the Middle Pechelbronn Beds were deposited in a brackish to marine environment and the Upper Pechelbronn Beds consist of fluvial/alluvial to marine deposits. In between the western and eastern masterfaults of the Upper Rhine Graben several fault blocks exist, with fault orientation being sub-parallel to the graben shoulders. During the deposition of the Pechelbronn Group these fault blocks acted as isolated depocenters, resulting in considerable thickness and depositional facies variations on the regional and local scale (few tens to several hundreds of meters).
Laboratory measurements of sonic wave velocity, density, porosity, permeability, thermal conductivity and diffusivity are conducted on the core samples. Based on lithology logs and macroscopic analysis of the core material, the Pechelbronn Group is classified into different lithofacies types. Statistically evaluated petrophysical parameters are assigned to each of these lithofacies types. The gamma-ray logs serve to verify the lithological classification and are further used for correlation analysis or joint inversion with the petrophysical data.
Well data, seismic sections, isolines and geological profiles are used to construct a geological/structural 3D model. The petrophysical, thermal and hydraulic rock properties, the temperature and the thickness of the model units are used to determine the expected flow rates and reservoir temperatures and thus the hydrothermal potential.