Geophysical Research Abstracts
Vol. 17, EGU2015-5781, 2015
EGU General Assembly 2015
© Author(s) 2015. CC Attribution 3.0 License.

Influence of shallow flow on the deep geothermal field of Berlin - Results from 3D models

Maximilian Frick (1), Judith Sippel (1), Magdalena Scheck-Wenderoth (1,2), Mauro Cacace (1), and Alireza Hassanzadegan (1)

(1) Helmholtz-Zentrum Potsdam Deutsches GeoForschungsZentrum GFZ, 4.4, Potsdam, Germany (sippel@gfz-potsdam.de), (2) RWTH Aachen, Aachen, Germany

The goal of this study is to quantify the influence of fluid-driven heat transport on the subsurface temperature distribution of the city of Berlin, Germany.
Berlin is located in the Northeast German Basin filled with several kilometers of sediments. Two of the clastic sedimentary units, namely the Middle Buntsandstein and the Sedimentary Rotliegend are of particular interest for geothermal exploration.
Previous studies in the Northeast German Basin have already shown that subsurface temperature distributions are highly dependent on the geometries and properties of the geological units. Our work benefits strongly from these studies that involve numerical modeling of coupled conductive and convective heat transport. We follow a two-step approach where we first improve an existing structural model by integrating newly available 57 geological cross-sections, well data and deep seismics (down to $\sim$4 km). Secondly, we perform a sensitivity analysis in which we investigate the effects of varying physical fluid and rock properties as well as hydraulic and thermal boundary conditions on the resulting temperature configuration. Computed temperatures are validated via comparison with existing well temperature measurements in the area.
Of special interest for this study is the influence of the shallow aquifer systems on the subsurface temperature field. The major constituents of this system are the Quaternary silts and sands, the Tertiary Rupelian clay and the Tertiary sands beneath the Rupelian. These units have different hydraulic properties. The Rupelian clay represents a major aquitard in this respect hydraulically disconnecting the pre- and post-Rupelian succession. This aquitard shows a heterogeneous thickness distribution locally characterized by different hydrogeological windows (i.e. domains of no thickness) enabling intra-aquifer groundwater circulation at depth thus having a first-order effect on the shallow thermal field.
As result of the simulations, we present temperature maps at fixed depths as well as for target horizons and isotherms of interest for geothermal prospect.