Geophysical Research Abstracts
Vol. 14, EGU2012-4507, 2012
EGU General Assembly 2012

Assessment of the impact of moving fluids on the regional thermal field for the area of Brandenburg (North German Basin)

V. Noack (1), M. Scheck-Wenderoth (1), M. Cacace (1,2), and B. Lewerenz (1)

(1) Helmholtz Centre Potsdam - GFZ German Research Centre for Geosciences, Telegrafenberg, D-14473 Potsdam, Germany(vera.noack@gfz-potsdam.de), (2) University of Potsdam, Am Neuen Palais 10, D-14469 Potsdam, Germany

We present results from numerical simulations of the 3D thermal field for the area of Brandenburg in the North German Basin. The study area encompasses a part of the basin centre in the north, whereas to the south the basin margin is enclosed. Starting with Permocarboniferous volcanic rocks the basin fill is represented by Permian to Cenozoic sediments. A thick layer of mobilized salt (Zechstein, Upper Permian) generated elevated structures such as salt pillows and diapirs. Especially where diapirs pierce their overburden, the overlying deposits are strongly influenced in their thickness and distribution. This special configuration of the Zechstein salt is relevant for the thermal calculations due to the fact that salt has a distinctly higher thermal conductivity than the surrounding sediments and is impermeable to fluid flow. Therefore, the Zechstein salt acts as a conductive chimney for heat and a hydraulic decoupling horizon between the Pre-Permian and the Mesozoic-Cenozoic strata. The latter are characterized by two further quasi-impervious sediment complexes, the Rupelian-clay and the Muschelkalk. These two divide the Post-Permian strata in three main aquifer systems: the Buntsandstein, Keuper to Pre-Rupelian and the Post-Rupelian complex.

Based on results from purely conductive modelling we additionally analyse the influence of moving fluids on the shallow temperature field above the Zechstein salt. Therefore coupled fluid flow and heat transfer numerical simulations are carried out to investigate the hydrothermal field. The 3D simulations for the heat transport processes are based on the finite element method.

The results indicate that the distribution of thermal conductivities in the basin fill controls the short-wavelength pattern of the temperature distribution whereas the long wavelength pattern results from interaction between the highly conductive crust and low conductive sediments. Furthermore, the results reveal that the shallow temperature field down to 2000 m depth is strongly influenced by fluid flow.