Geophysical Research Abstracts
Vol. 12, EGU2010-3304, 2010
EGU General Assembly 2010

Coupled fluid flow and heat transport modelling of the North East German Basin

B. O. Kaiser (1,2), M. Cacace (1,2), M. Scheck-Wenderoth (2), and B. Lewerenz (2)

(1) University of Potsdam, Institute for Geosciences, (2) Helmholtz Centre Potsdam, German Research Centre for Geosciences

The goal of the present study is to investigate and quantify the main physical processes and parameters affecting the regional thermal setting within the North East German Basin (NEGB) by means of 3D numerical simulations.

The NEGB is structurally controlled by the presence of a thick sequence of Upper Permian Zechstein salt acting as a decoupling horizon between the Mesozoic and Cenozoic strata and the pre-Zechstein sediments. Apart from affecting the mechanical evolution of the basin, the salt structures locally modify the regional geothermal field. Interactions between salt structures and thermal anomalies result in an active convective system within the basin as also constrained by hydrogeochemical studies.

We present results from numerical simulations of coupled fluid flow, heat and mass transport processes based on a detailed 3D geological model of the NEGB. The model integrates the major Permian to Cenozoic sediment fill. The degree of coupling in the governing equations is gradually increased to discriminate between the different active energy drivers within the basin. Stabilizing/destabilizing effects on the subsurface temperature field as triggered by variations in fluid density and viscosity as well as gradients in rock properties (e.g. permeability) are also addressed.

Modelling results suggest that the thick Zechstein salt covering large areas in the basin exerts a primary control on the regional hydrothermal setting.Interaction between salt structures triggering positive thermal anomalies in the post salt sequence and the hydrogeology of the salt overburden may be sufficient to promote convection on a regional scale. Additionally, these results provide useful information to be integrated in future modelling efforts aiming to help to constrain the potential geothermal resources and reserves of the basin.