Geophysical Research Abstracts
Vol. 13, EGU2011-3065, 2011
EGU General Assembly 2011


# Regional scale 3D modelling of the coupled fluid flow and heat transfer of the Northeast German Basin

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The internal geological structure of the Northeast German Basin (NEGB) is characterized by the presence of a relatively thick sequence of Permian Zechstein salt (up to 5 km). The Zechstein salt layer is highly structured in many salt diapirs and pillows locally reaching the near surface. Apart from acting as a mechanical decoupling horizon between the supra and sub salt sequences, the salt layer strongly affects the fluid regime and the thermal configuration of the basin.

Based on a detailed geological model of the NEGB 3D numerical simulations of coupled fluid and heat transport are carried out. The goal of the study is to (a) investigate effects and main characteristics of the different energy driving mechanisms. We assess whether conductive, advective or convective heat transport mechanisms affect the internal temperature distribution within the basin, and (b) to quantify their relative contribution to the resulting basin-wide thermal field.

From the model results, the regional temperature distribution within the basin is likely to result from interactions between regional pressure forces as driven by topographic gradients and thermal diffusion locally enhanced by thermal conductivity contrasts between the different sedimentary rocks with the highly conductive salt playing a prominent role. In contrast, buoyancy forces triggered by temperature dependent fluid density variations are demonstrated to affect only locally the internal thermal configuration. Locations, geometry and wavelengths of convective thermal anomalies are mainly controlled by the permeability field and thickness values of the respective geological layers.