MOOSE/TIGER: New High-Performance Simulator for Nonlinear Coupled THMC Processes

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ABSTRACT

The main key to the utilization of thermal energy is to understand the controlling factors of the thermal fields in reservoirs. It has been shown during the last decades that temperature can be highly affected by the groundwater circulation in fractures and faults which causes thermo-convective heat and mass transfers.

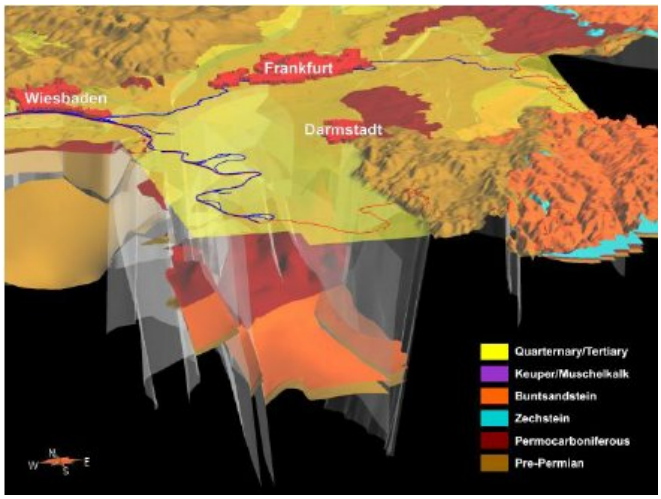

Figure 1: 3D geological model showing the northern Upper Rhine Graben with major faults and fractures

This paper introduces a new numerical tool, called TIGER, for modelling the heat and mass transfers in 3D. TIGER is a MOOSE-based (Gaston et al. 2009) application developed by Institute of Applied Geosciences, KIT. It is capable of modelling faults and well paths as (lower dimensional) discrete features in order to simulate thermal-hydro-solute transports in a fully-coupled and fully-implicit manner for anisotropic porous media. The main purpose of this study is to show practical applications of this code to better understand temperature anomalies and to avoid model simplifications for surrounding boundaries in geothermal reservoirs. There are several problems provided for showing the capabilities of this code in the simulation of diverse geothermal applications.

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